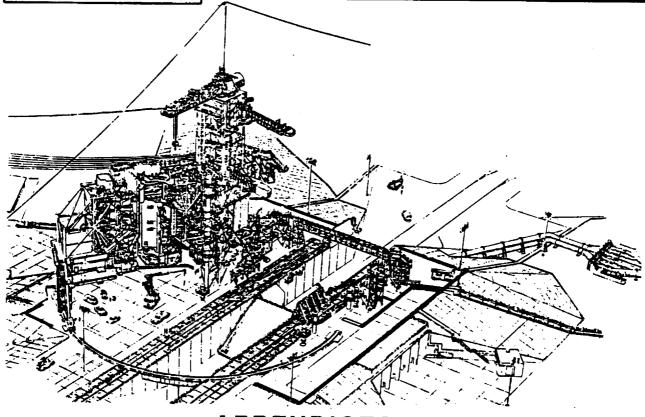


LIQUID ROCKET BOOSTER INTEGRATION STUDY



APPENDICES VOLUME V OF V

PART 1
SECTIONS 1-7

FINAL REPORT PHASE I

NAS10-11475 NOVEMBER 1988

Space Operations Com

N91-30259

(NASA-CR-188767) LIQUID ROCKET BOOSTER
INTEGRATION STUDY. VOLUME 5, PART 1:

81005-01BL6 APPENDICES Final Report (Lockheed Space Operations Co.) 256 p CSCL 21H

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LIQUID ROCKET BOOSTER INTEGRATION STUDY

VOLUME V OF V
APPENDICES
PART 1
SECTIONS 1-7

KENNEDY SPACE CENTER NAS10-11475

PREPARED BY:
LOCKHEED SPACE OPERATIONS COMPANY

Gordon E. Artley Lockheed Study Manager W. J. Dickinson NASA Study Manager

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LRBI FINAL REPORT CONTENTS GUIDE

VOLUME I - EXECUTIVE SUMMARY

VOLUME II - STUDY SUMMARY

SECTION 1: <u>LRBI Study Synopsis</u> - An assessment of the study objectives, approach, analysis, and rationale. The study findings and major conclusions are presented.

SECTION 2: <u>Launch Site Plan</u> - An implementation plan for the KSC launch site integration of LRB ground processing. The plan includes details in the areas of facility activations, operational schedules, costs, manpower, safety and environmental aspects.

SECTION 3: <u>Ground Operations Cost Model (GOCM)</u> - The updating and enhancement of this NASA provided computer-based costing model are described. Its application to LRB integration and instructions for modification and expanded use are presented.

SECTION 4: Cost - Summary and Analysis of KSC Costs.

VOLUME III - STUDY PRODUCTS

The study output has been developed in the form of nineteen derived study products. These are presented and described in the subsections of this volume.

VOLUME IV - REVIEWS AND PRESENTATIONS

The progress reviews and oral presentations prepared during the course of the study are presented here along with facing page text where available.

VOLUME V - APPENDICES

Study supporting data used or referenced during the study effort are presented and indexed to the corresponding study products.

LIST OF ABBREVIATIONS AND ACRONYMS

ADP Automatic Data Processing

A&E Architectual and Engineering

AF Air Force

AI Artificial Intelligence

AL Aluminum

AL-Li Aluminum Lithium Alloy
ALS Advanced Launch Systems

ALT Alternate

AOA Abort Once Around

AOPL Advanced Order Parts List

AP Auxiliary Platform
APU Auxiliary Power Unit

ARF Assembly and Refurbishment Facility

ARTEMIS Accounting, Reporting, Tracking, & Evaluation Management - Information

System

ASRM Advanced Solid Rocket Motor

ASSY Assembly

ATO Abort to Orbit

ATP Authority to Proceed

AUTO Automatic

AWCS Automated Work Control System

BITE Built-in Test Equipment

BLOW Booster Liftoff Weight

BOC Base Operations Contractor

BSM Booster Separation Motor

C Celsius

CAD Computer Aided Design

CALS Computer Aided Logistics System
CCAFS Cape Canaveral Air Force Station

CCB Change Control Board
CCC Complex Control Center

CCF Compressor Converter Facility

CCMS Checkout, Control and Monitor Subsystem

CDDT Countdown Demonstration Test

CDR Critical Design Review

CEC Core Electronics Contractor
CER Cost Estimating Relationships

CG Center of Gravity

CH4 Methane

CITE Cargo Integration Test Equipment

CM Construction Management

Configuration Management

C/O Closeout

Checkout

CONC Concrete

C of F Cost of Facilities
COMM Communications

CPF Cost per Foot

CPF2 Cost per Square Foot CPF3 Cost per Cubic Foot

CPM Critical Path Management
CPU Central Processing Unit

CR Control Room
Cryo Cryogenic

C/S Contractor Support
CT Crawler Transporter

CY Calendar Year

dBase Data Base - Software Program

dc Direct Current

DDS Data Processing System

DDT&E Design, Development, Test & Engineering

DE Design Engineering

DEQ Direct Equivalent Head Count
DFRF Dryden Flight Research Facility

DFI Development Flight Instrumentation

DHC Direct Head Count

DIST Distributor

DOD Department of Defense
DOS Disk Operating System

DOT Department of Transportation

ECLSS Environmental Control & Life Support System

ECS Environmental Control System

EL Elevation

ELS Eastern Launch Site

ELV Expendable Launch Vehicle

EMA Electrical Mechanical Actuator

EMERG Emergency

EPA Environmental Protection Agency

EPDC Electrical Power and Distribution Control

EPL Emergency Power Level

ET External Tank

ET-HPF External Tanks - Horizontal Processing Facility

ETR Eastern Test Range

F Fahrenheit

FAA Federal Aviation Administration

F&D Fill & Drain

FEP Front End Processor

FLT Flight

FMEA/CIL Failures Modes & Effects Analysis/Critical Items List

FRF Flight Readiness Firing

FRSC Forward Reaction Control System

ft Feet

FSS Fixed Service Structure

FWD Forward Fy Fiscal Year

G&A General and Administrative

G,g Acceleration of Gravity

GAL Gallons

GDSS(GD) General Dynamics Space Systems

GEN Generator

GFE Government Furnished Equipment

GH2 Gaseous Hydrogen
GHe Gaseous Helium

GLOW Gross Liftoff Weight

GLS Ground Launch Sequencer

GN2 Gaseous Nitrogen

GN&C Guidance, Navigation & Control

GOAL Ground Operations Aerospace Language

GOX Gaseous Oxygen

GOCM Ground Operations Cost Model

GPC General Purpose Computer

GPM Gallons Per Minute

GRD Ground

GSE Ground Support Equipment
GSFC Goddard Space Flight Center

GTSI Grumman Technical Services, Inc.

GUCP Ground Umbilical Carrier Plate

H2 Hydrogen

HAZGAS Hazardous Gas

HB High Bay

HDP Holddown Post

He Helium

HIM Hardware Interface Module

HMF Hypergolics Maintenance Facility

HPF Horizontal Processing Facility

HQ Headquarters

HVAC Heating, Ventilation, and Air Conditioning

HW Hardware
HYD Hydraulic(s)
HYPER Hypergolic

Hz Hertz

IBM International Business Machines

ICD Interface Control Document

I/F Interface

ILC Initial Launch Capability

INST Instrumentation

INTEG Integration

IOC Initial Operational Capability

IPR Interum Problem Report

IRD Interface Requirements Document

IUS Interial Upper Stage

JSC Johnson Space Center

K Thousands

Kelvin

KLB Thousands of PoundsKSC Kennedy Space Center

KW Kilowatt

LAC Launch Accessories Contractor

LC-39 Launch Complex 39
LCC Life Cycle Cost

Launch Control Center

LCH4 Liquid Methane

LESC Lockheed Engineering and Science Company

LETF Launch Equipment Test Facility

LEO Low Earth Orbit
LH2 Liquid Hydrogen

Li Lithium

LN2 Liquid Nitrogen

LNG Liquid Natural Gas

LO2 Liquid Oxygen

LOX Liquid Oxygen

LPS Launch Processing System

LRB Liquid Rocket Booster

LRB-HPF Liquid Rocket Booster Horizontal Processing Facility

LRBI Liquid Rocket Booster Integration

LRU Line Replaceable Unit

LSE Launch Support Equipment

LSOC Lockheed Space Operations Company

LUT Launcher Umbilical Tower

MAX Maximum

MECO Main Engine Cutoff

MDAC McDonnell Douglas Astronautics Company

MIL Military

MIN Minimum

MLP · Mobile Launch Platform

MMC Martin-Marietta Corporation

MMH Mono Methyl Hydrazine

MOD Mission Operations Directorate

MOU Memorandum of Understanding

MP Manpower

MPS Main Propulsion System

MSBLS Microwave Scanning Beam Landing System

MSFC Marshall Space Flight Center

MST Mobile Service Tower
MTI MortonThiokol, Inc.

N2 Nitrogen

NASA National Aeronautics and Space Administration

NDE Non-Destructive Evaluation

NDT Non-Destructive Test

NF Nose Fairing

N2O2 Nitrogen Tetroxide

NPL Nominal Power Level

NPSH Not positive Suction Head NRC National Research Council

NSTL National Space Technology Laboratories (Stennis Space Center)

NSTS National Space Transportation System

NWS National Weather Service

OAA Orbiter Access Arm

OIS Operational Intercommunications System

OJT On-the-job Training

O&M Operations and Maintenance

OMD Operating and Maintenance Documentation

OMI Operations and Maintenance Instruction

OMRF Orbiter Maintenance and Refurbishment Facility

OMRSD Operational Maintenance Requirements and Specifications Document

OMS Orbital Maneuvering System
OPF Orbiter Processing Facility

OPS Operations

OMBUU Orbiter Mid Body Umbilical Unit

ORB Orbiter

ORD Operational Readiness Date

ORI Operational Readiness Inspection

OSHA Occupational Safety & Health Administration

OTV Operational Television

PA Public Affairs

PAWS Pan Am World Services, Inc.
P/A Propulsion/Avionics Module

Pc Engine Combustion Chamber Pressure

PC Personal Computer

PCM Pulse Code Modulator

PCR Payload Changeout Room
PDR Preliminary Design Review

PER Preliminary Engineering Report

PGHM Payload Ground Handling Mechanism

PIC Pyro Initiator Controller

PIF Payload Integration Facility

P/L Payload

PMM Program Model Number

PMS Permanent Measuring System

PO Purchase Order

POP Programs Operations Plan

PR Problem Report

PRACA Problem Reporting and Corrective Action
PRCBD Program Review Control Board Directive

PRC Planning Research Corporation **PRD**

Program Requirements Document

PRESS Pressure, pressurization

PROP Propellant

PRR Preliminary Requirements Review

PSI Pounds Per Square Inch

Pounds Per Square Inch Absolute psia psig Pounds Per Square Inch Gage

PSP Process Support Plan

PT&I Payroll Taxes and Insurance P&W Pratt & Whitney Company

Q Dynamic Pressure QA Quality Assurance

Q-Alpha Dynamic Pressure x Angle of Attack

QC **Quality Control** QD Quick Disconnect

QTY Quantity

R Ranking

RAM Random Access Memory RCS Reaction Control System R&D Research and Development

RF Radio Frequency **RFP** Request for Proposal

RIC Rockwell International Corporation

ROM Rough Order of Magnitute

RP-1 Propellant (Kerosene Related Petroleum Product)

RPL Rated Power Level

RPS Record and Playback System

RPSF Rotation, Processing & Surge Facility R/R Remove/Replace

RSLS Redundant Set Launch Sequencer

RSS Rotating Service Structure

R&T Research and Technology

RTLS Return to Launch Site

SAIL Shuttle Avionics Integration Laboratory

SAB Shuttle Assembly Building

SCAPE Self-Contained Atmospheric Protective Ensemble

SDI Strategic Defense Initiative
SDV Shuttle Derivative Vehicle
SEB Source Evaluation Board
SEC Second(s), Secondary

SGOS Shuttle Ground Operations Simulator

SIES Supervision, Inspection & Engineering Services

SIT Shuttle Integrated Test

System Integrated Test

SLC-6 Shuttle Launch Complex No.6

SLF Shuttle Landing Facility
SOFI Spray On Foam Insulation

SOW Statement of Work

SPC Shuttle Processing Contractor
SPF Software Production Facility

SPDMS Shuttle Processing Data Management System

SRB Solid Rocket Booster
SRM Solid Rocket Motor

SRSS Shuttle Range Safety System

SR&QA Safety, Reliability and Quality Assurance

SSC Stennis Space Center (NSTL)
SSME Space Shuttle Main Engine

SSV Space Shuttle Vehicle

STD Standard

STS Space Transportation System

SUBSTA Substation
SW Switch
S/W Software

TAL Transatlantic Landing
TBD To Be Determined
T&C/O Test and Checkout

TFER Transfer
T-0 Liftoff Time

TOPS Technical Operating Procedures
TPS Thermal Protection System

TSM Tail Service Mast

TTV Termination/Test/Verification

TVA Thrust Vector Activator
TVC Thrust Vector Control
T/W Thrust to Weight Ratio

TYP Typical

ULCE Unified Life Cycle Engineering

UMB Umbilical

UPS Unintegrated Power System
USAF United States Air Force

USS Utility Substation

V Volt(s)

VAB Vehicle Assembly Building
VAFB Vandenberg Air Force Base
VIB Vertical Integration Building
VLS Vandenberg Launch Site
VPF Vertical Processing Facility

WAD Work Authorization Document

WBS Work Breakdown Structure

WIP Work in Progress

WSMR White Sands Missile Range

WTR Western Test Range

VOLUME V

SECTION 1

LRB GROUND OPERATIONS PLAN

VOLUME V APPENDIX 1

RETRIEVAL/DISASSEMBLY/REFURBISHMENT

TABLE OF CONTENTS

1.1	SCENARIO
1.2	FACILITY REQUIREMENTS
1.3	GSE/LSE
1.4	OPERATIONAL TIMELINES
1.5	MANPOWER
1.6	COSTS

VOLUME V APPENDIX 1

RETRIEVAL/DISASSEMBLY/REFURBISHMENT

During the flight hardware downselection process, both MSFC Phase-A study contractors considered reusable booster configurations. As a result of independent mid-term trade studies, both MMC and GDSS subsequently eliminated the reusable booster configurations from further study. Prior to this downselection, a cursory evaluation of the launch site requirements for LRB retrieval, disassembly and refurbishment was performed. The study methodology utilized is typical to the techniques described in Volume III of this report.

1.1 SCENARIO

The following recovery scenario has been employed for the station set impact analysis.

- Fully recoverable LRB
- Downrange wet recovery with parachutes
- LRB secured to the deck of the recovery barge (no tow back)
- Partial safing and initial washdown occurring on the recovery barge
- Recovery barge tug to CCAFS
- LRB barge removal by travel lift to ground transporter
- Final safing and washdown
- Disassembly as required
- Parachutes to the KSC parachute facility (by truck)

- Engines to the LRB engine manufacturer for refurbishment (by plane)
- LRB to the manufacturer for refurbishment (by barge)

This scenario was selected for study primarily because it most closely resembled the current SRB recovery scenario, in comparison to the proposed alternate LRB recovery options of down-range wet or dry recovery of the propulsion/avionics module only; or the RTLS LRB toss-back and tow-back options. The downrange wet full recovery is feasible, practical, and reliable. It has the lowest technical risk and the launch site operations are established.

1.2 FACILITY REQUIREMENTS

The station set configuration must provide capability to support the following:

- Recovery barge operations and maintenance
- LRB safing and washdown
- LRB disassembly
- LRU handling, storage and transportation to the refurbishment sites

Our current facility concept envisions a new facility for LRB safing and washdown, sized to accommodate one LRB; a new facility for LRB disassembly including office and logistics areas, sized to accommodate one LRB flight set; and a new barge dockage/slip area, sized to accommodate two recovery barges.

The decision to proceed with new facilities in lieu of modifying the existing SRB Hangar AF facilities is based on technical and schedule issues. The increased LRB diameters and lengths cannot be accommodated by the Hangar AF facilities. Modification activity will disrupt SRB/STS recovery and disassembly operations, impact SRB refurbishment schedules and potentially have a ripple effect to the STS flight rate.

The preferred facility siting plan is south and adjacent to the CCAFS Hangar AF facilities. This site eliminates extensive dredging in the Banana River, required to support the recovery barge traffic from the Port Canaveral locks to the Hangar AF area.

This station set requires approximately 85,000 square feet of facility under roof, and approximately 90,000 square feet of combined apron/dockage area, with at least 200 feet fronting the Banana River.

End-to-end implementation can be accomplished in approximately 24 months utilizing a design/build concept or 36 months utilizing conventional implementation techniques. These conceptual durations exclude the time required to prepare and process the environmental impact statements.

1.3 GSE/LSE

It must be recognized that the ground support equipment and launch support equipment for LRB retrieval and disassembly is in the early conceptual stage. The following is a preliminary list of unique systems and equipment expected to be required at this station set.

GSE

- High pressure de-ionized water spray system robot controlled
- Hazardous waste containment system
- Engine handling equipment

• LSE

- Recovery barge (2)
- Commercial Tug (2)
- Travel lift 150 ton (1)

1.4 OPERATIONAL TIMELINES

The LRB operational timelines are not expected to differ radically from the projected 1996 timelines for SRB retrieval and disassembly. The following is a synopsis of the projected LRB operational timelines for one LRB flight set.

Pre-launch OPS 7 days
At sea recovery OPS 2 days
Safing and washdown 3 days
Disassembly 7 days

These timelines are not expected to be schedule critical at the launch site.

1.5 MANPOWER

The LRB processing manpower requirements are expected to be similar to the current SRB headcount, in support to retrieval and disassembly. LRB headcount will peak at 160 SPC type personnel and 60 civil servant and BOC type personnel in FY 1998 and remain constant through the program duration. Initial staffing must start in FY 1995, for training and certification, and initial headcount is projected at 50% of the peak staffing level.

All personnel will be stationized. This is consistent with the staffing philosophy presented in Volume III Section 6 of this report. As LRB/STS flight rate ramps up and SRB/STS flights are phased out, the opportunity exists to transition SRB retrieval and disassembly personnel to the LRB program. This could occur as early as FY 1997.

1.6 COSTS

The total Life Cycle Cost (LCC) for LRB retrieval and disassembly is currently projected at approximately \$185.0 million. This includes the non-recurring costs conceptualized at \$50.0 million (includes 40% NASA wrap factor) and the recurring costs estimated at \$135.0 million. The recurring costs are based upon a projected total manpower requirement of 2420 man years, at a burdened cost of \$50,000 per man year; and commercial tug leasing for 122 LRB/STS flights at \$100,000 per flight. The Life Cycle Costs are in FY 1987 dollars, and are rough-order of magnitude.

The LCC specifically excludes costs for the following:

- LRB refurbishment
- LRB engine refurbishment
- Recurring spares
- Hazardous waste handling
- SRB de-activation

VOLUME V

SECTION 2

LRB PROCESSING TIMELINES

VOLUNE V - SECTION 2 APPENDIX

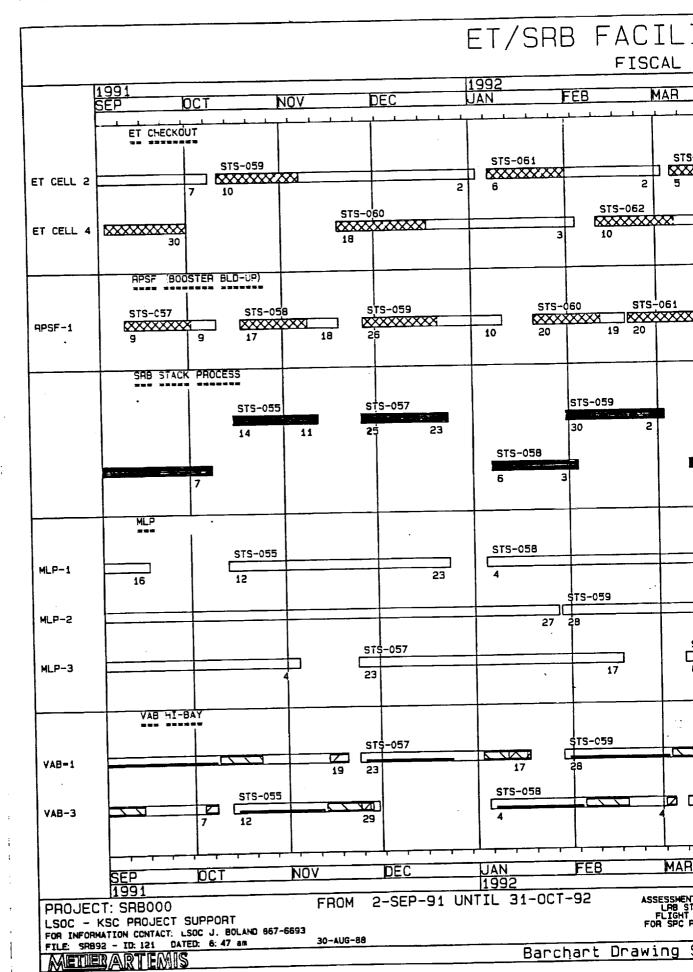
TABLE OF CONTENTS

- 2.1 ET/SRB BASELINE FACILITY UTILIZATION (FY 1992 THRU FY 2007)
- 2.2 ET/SRB FACILITY OPEN PERIODS (FY 1992 THRU 2007)
- 2.3 ORBITER/SSV FACILITY UTILIZATION (FY 1990 THRU FY 2007)

VOLUME V

SECTION 2

LRB PROCESSING TIMELINES



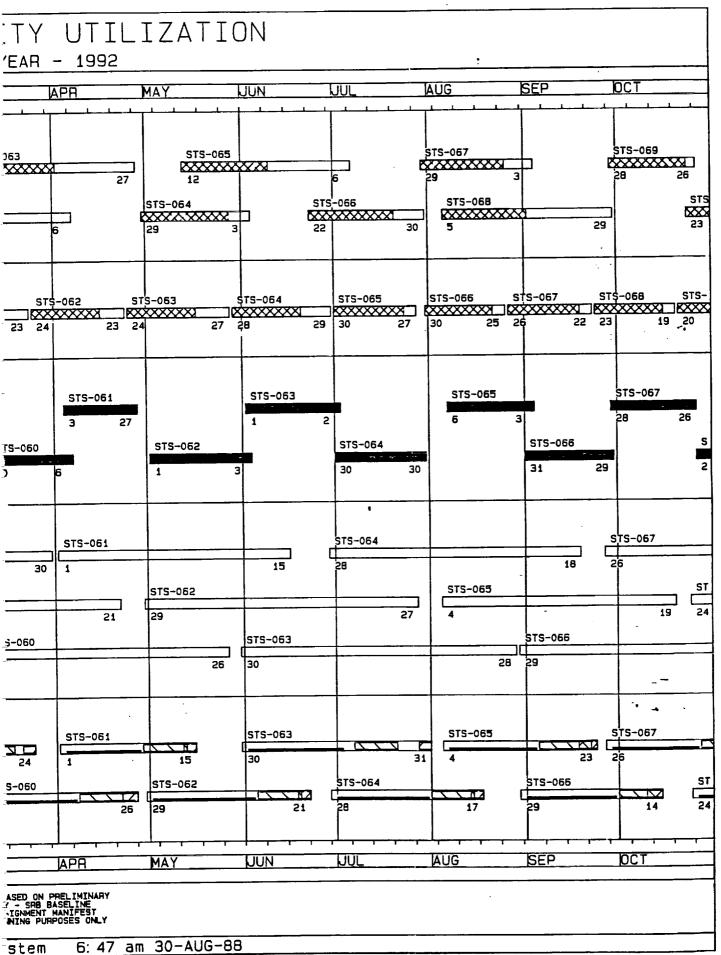
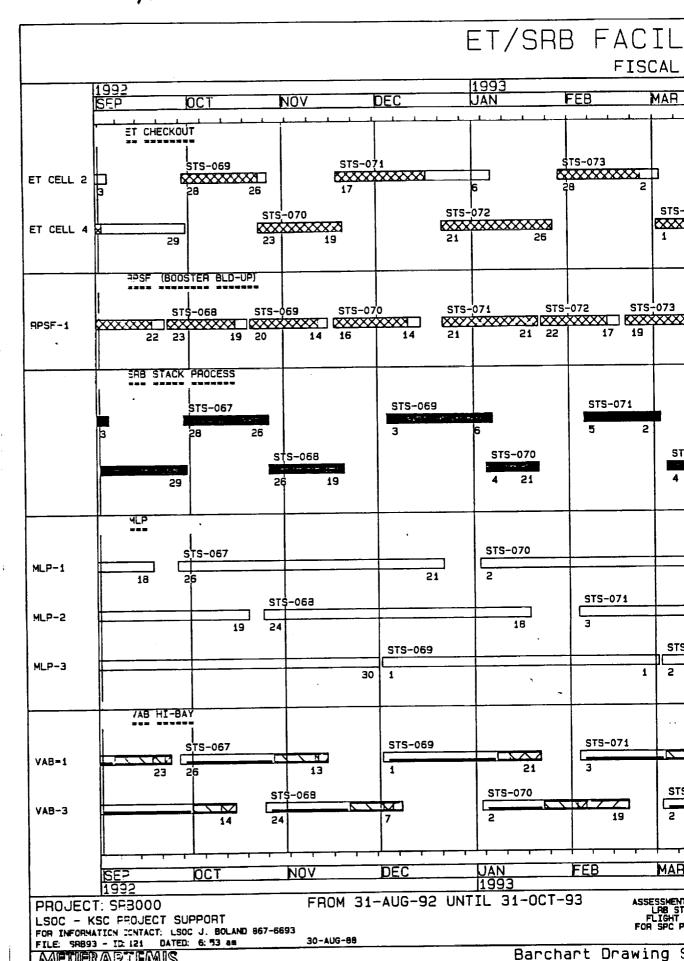


Figure 2.1-1. FY 1992 ET/SRB Facility Utilization.



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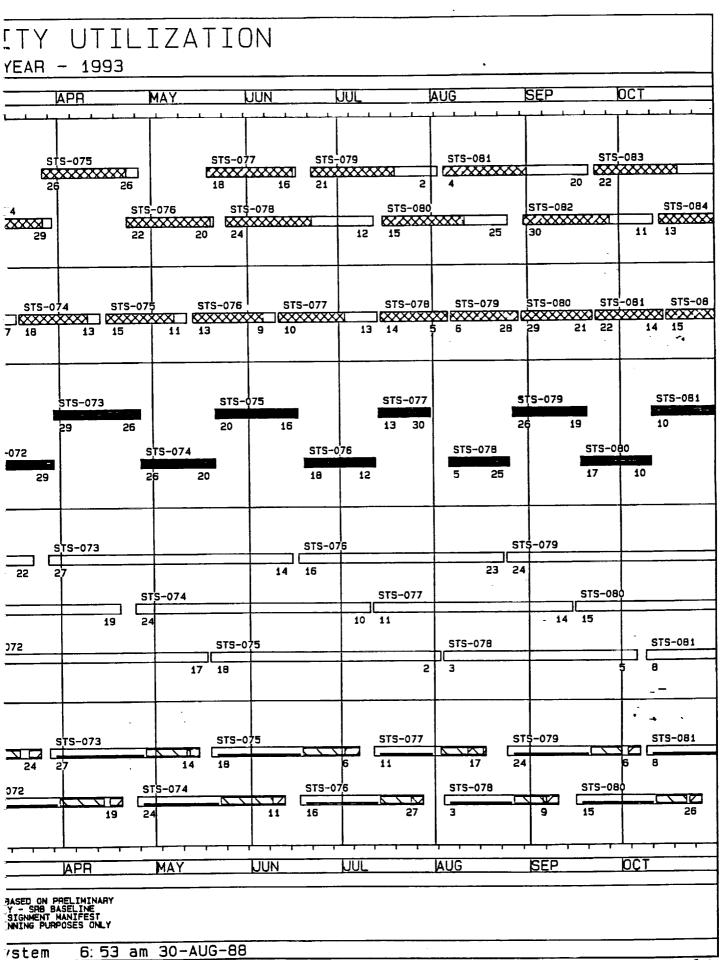
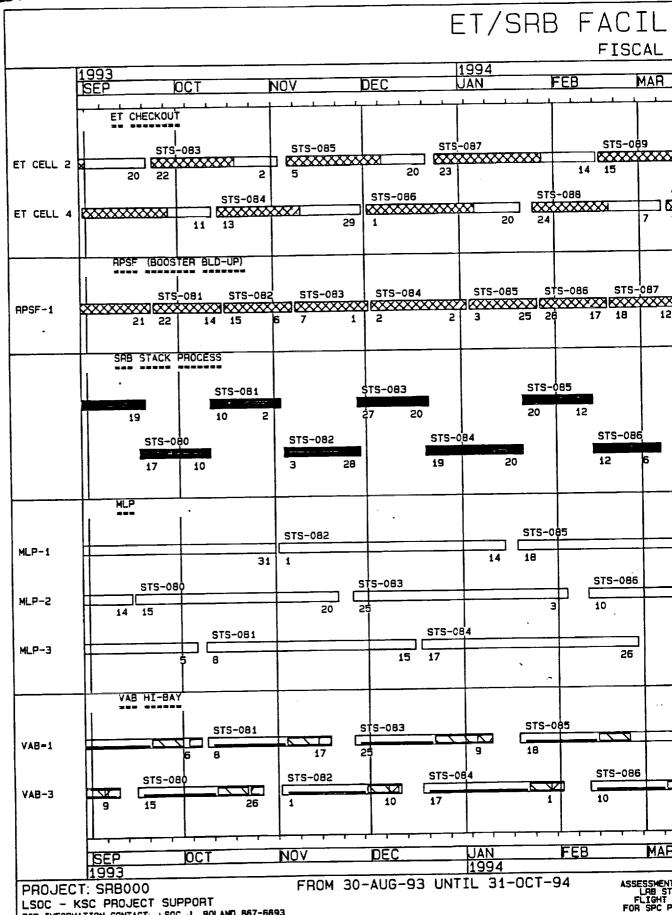


Figure 2.1-2. FY 1993 ET/SRB Facility Utilization. 5-2 10-26 1:0



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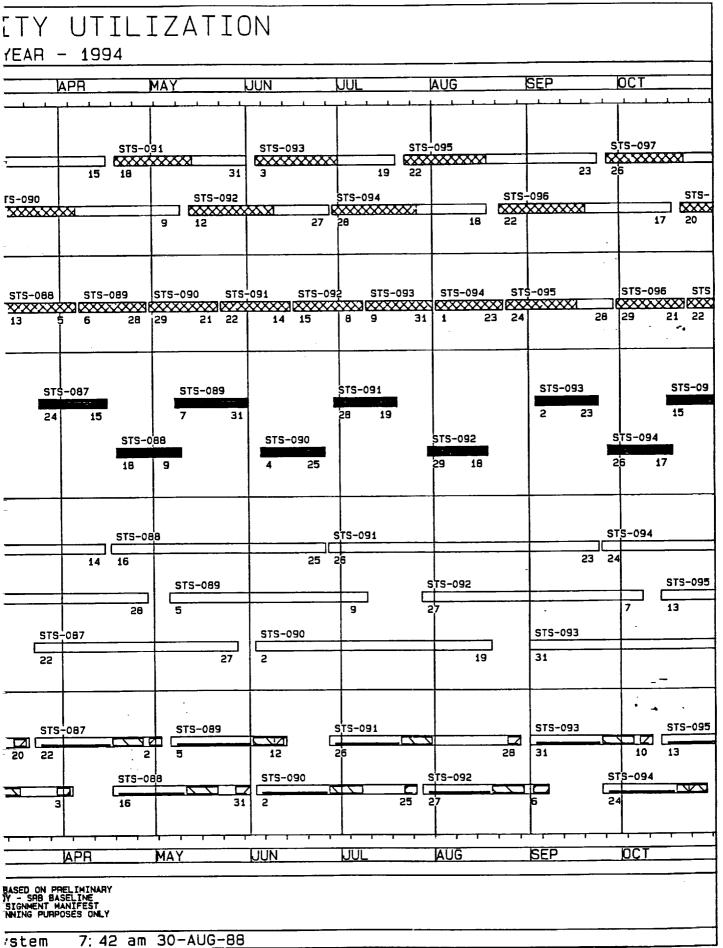
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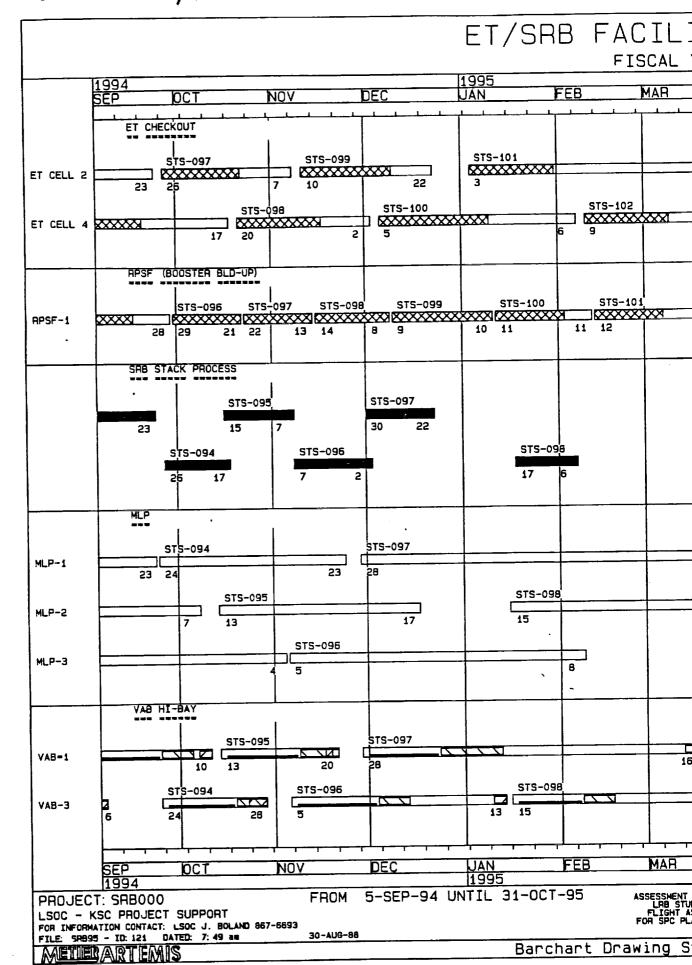
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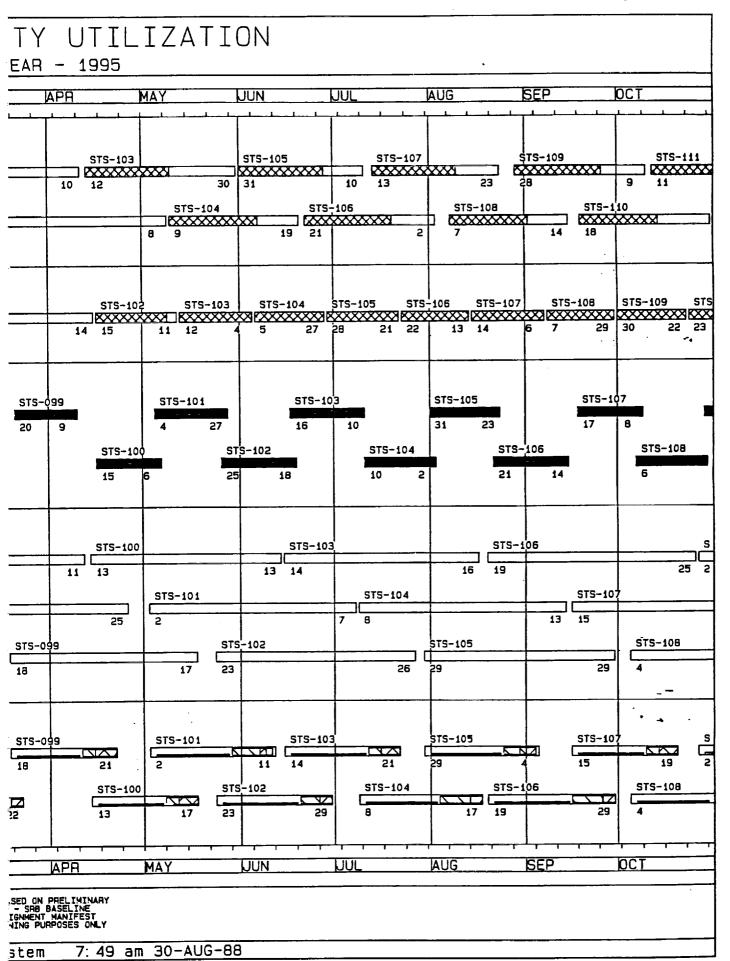
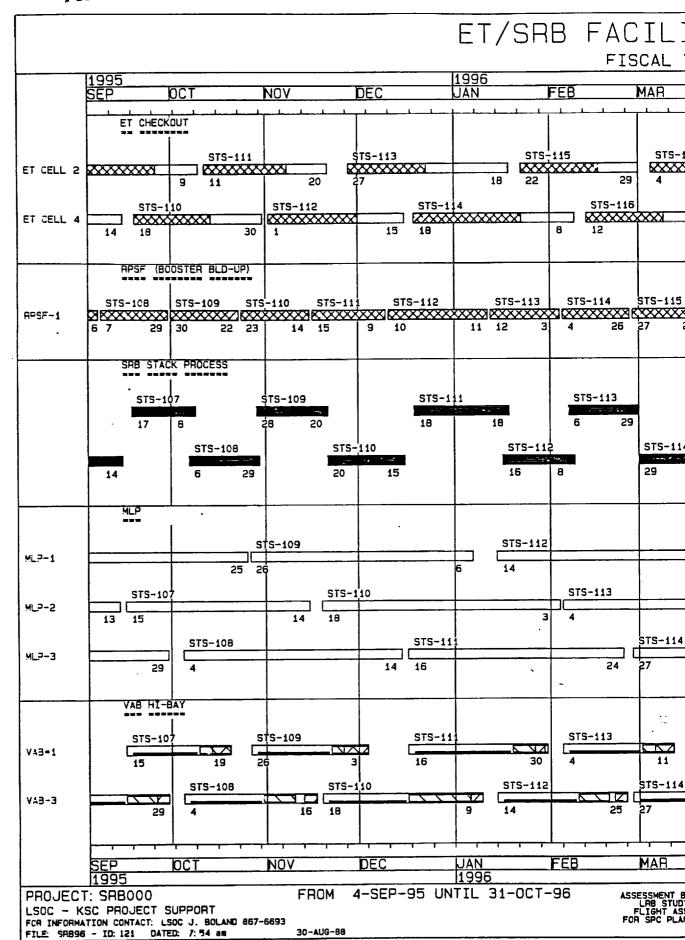
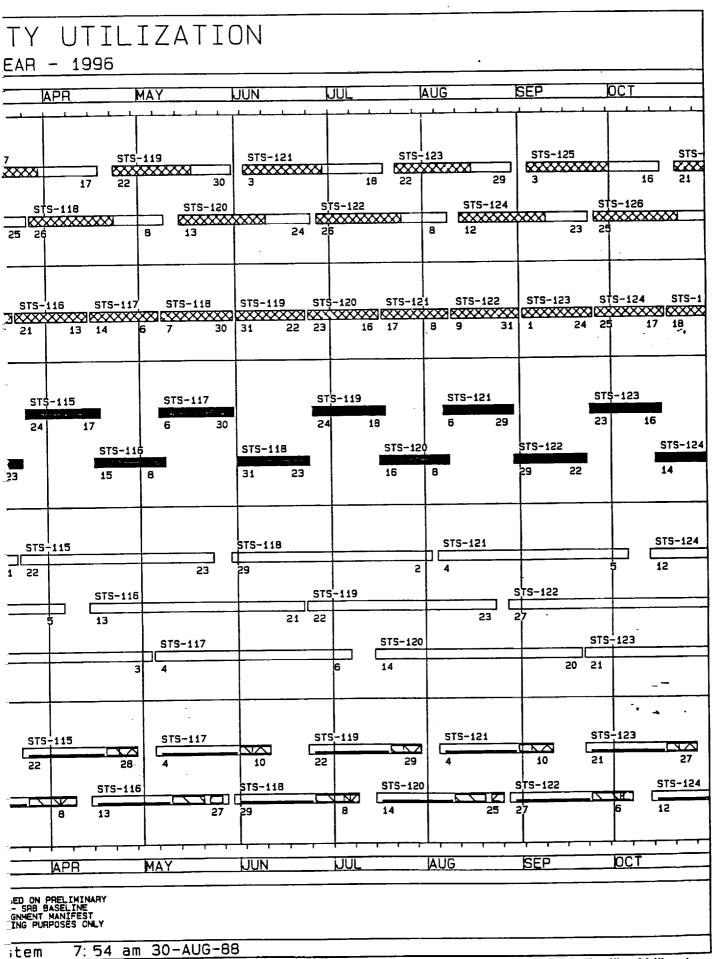


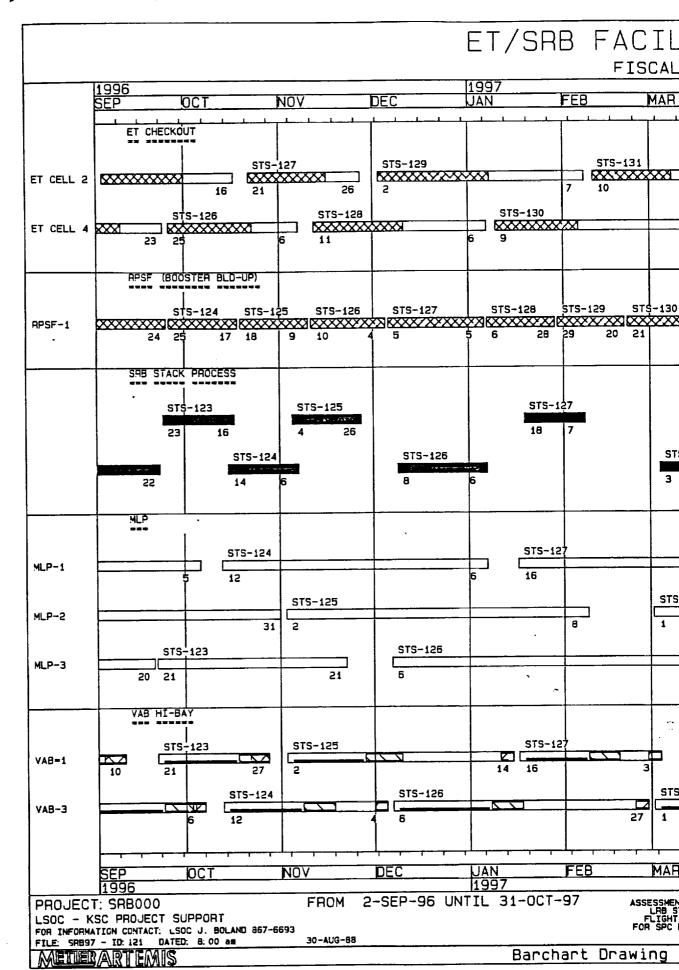
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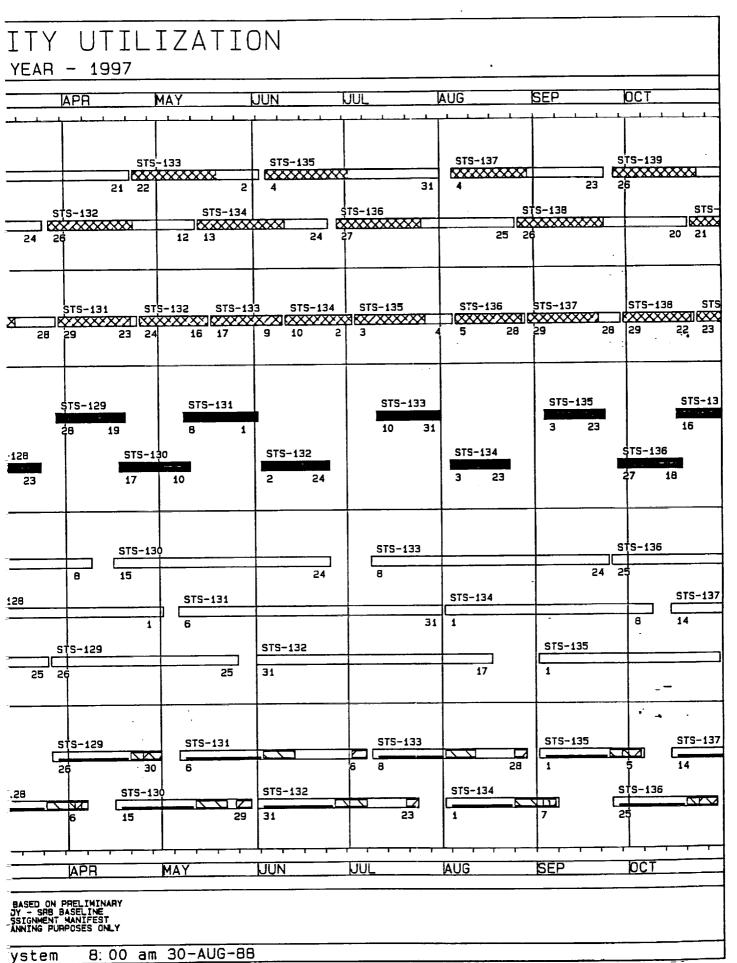


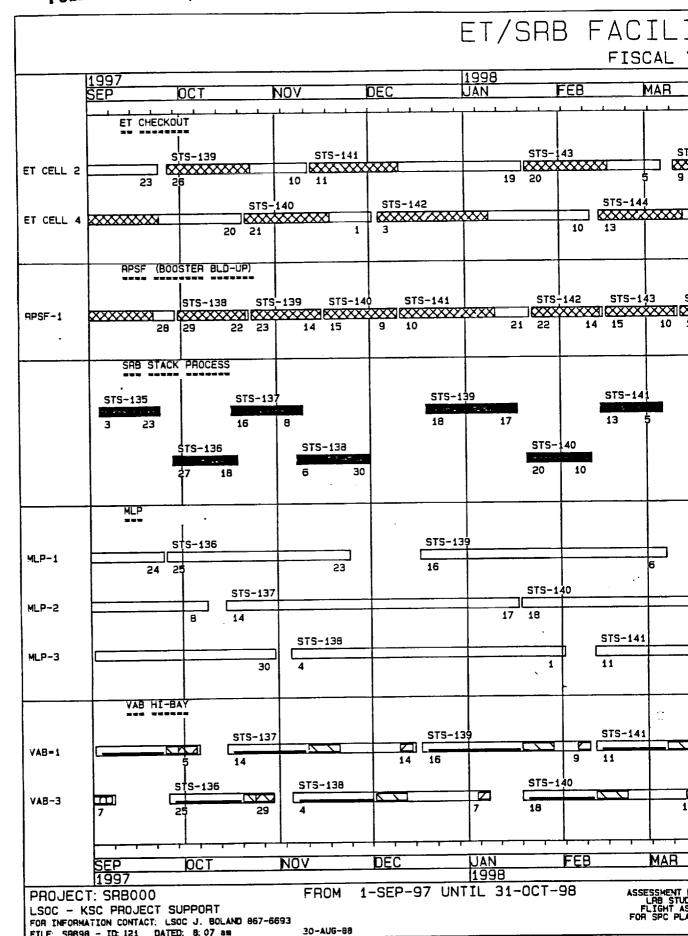
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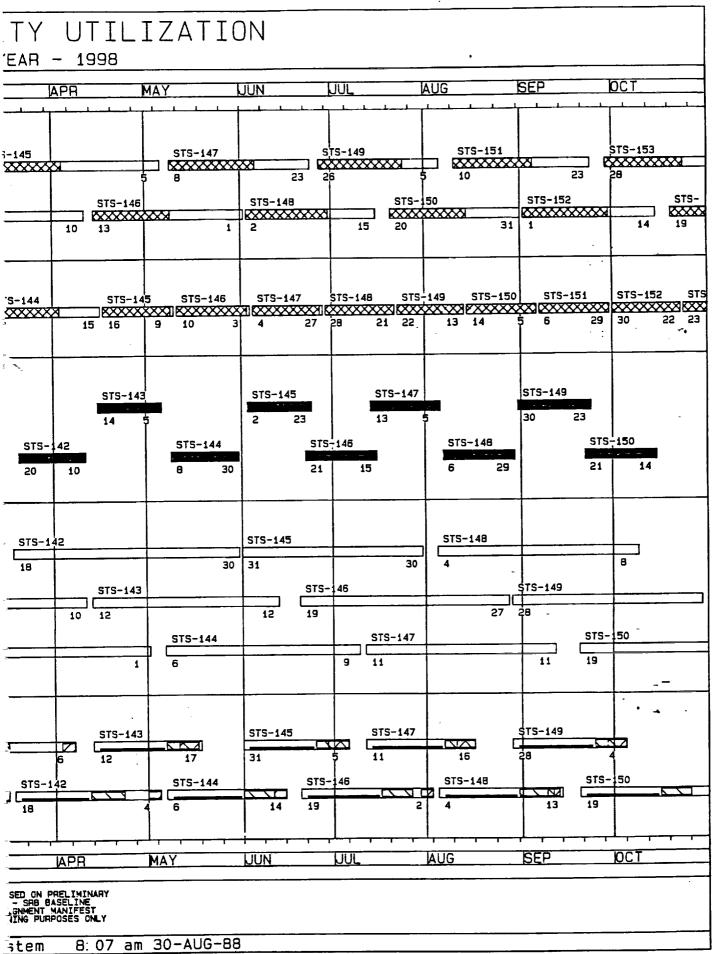
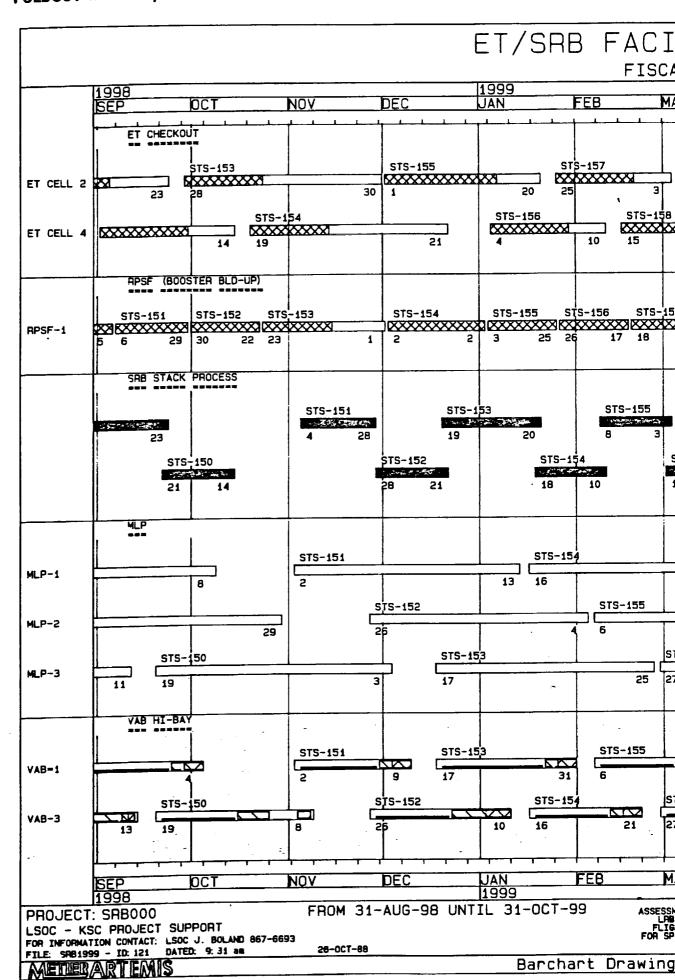
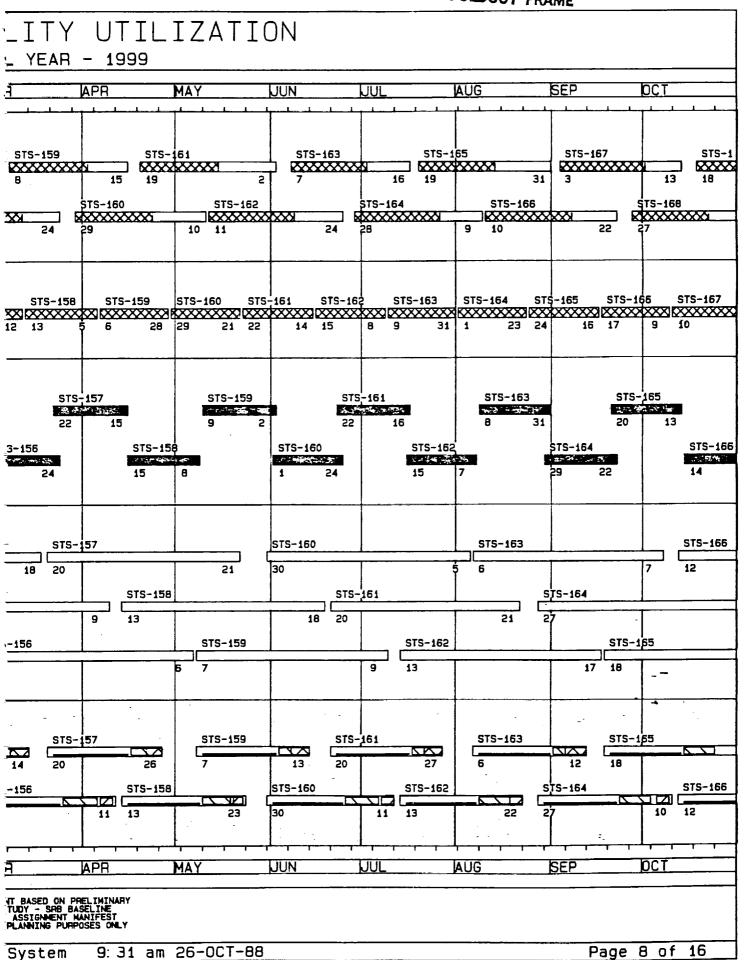
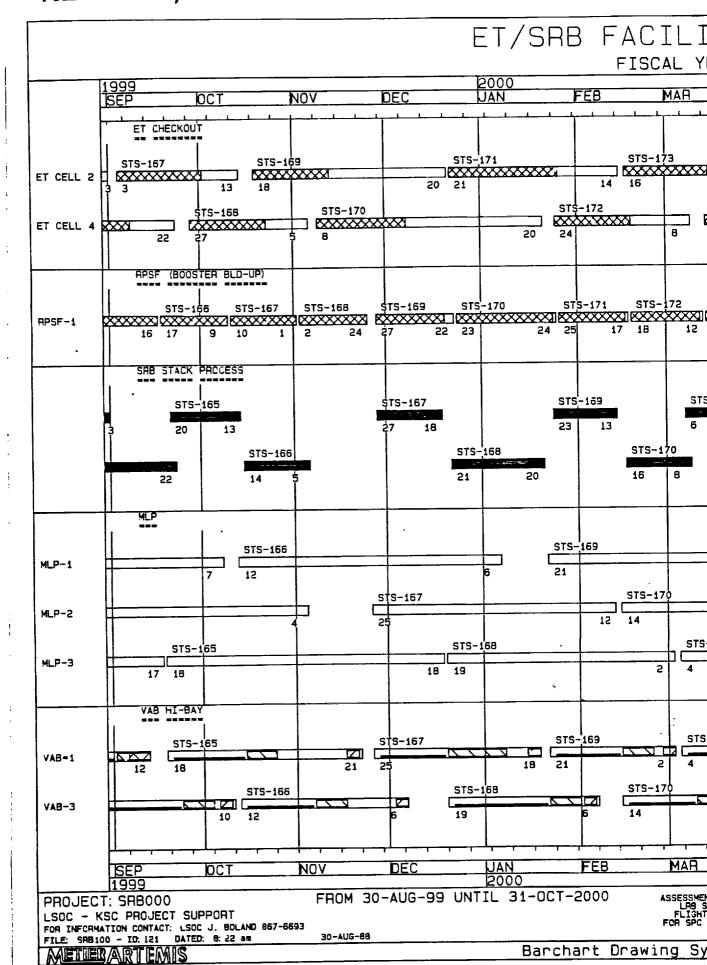
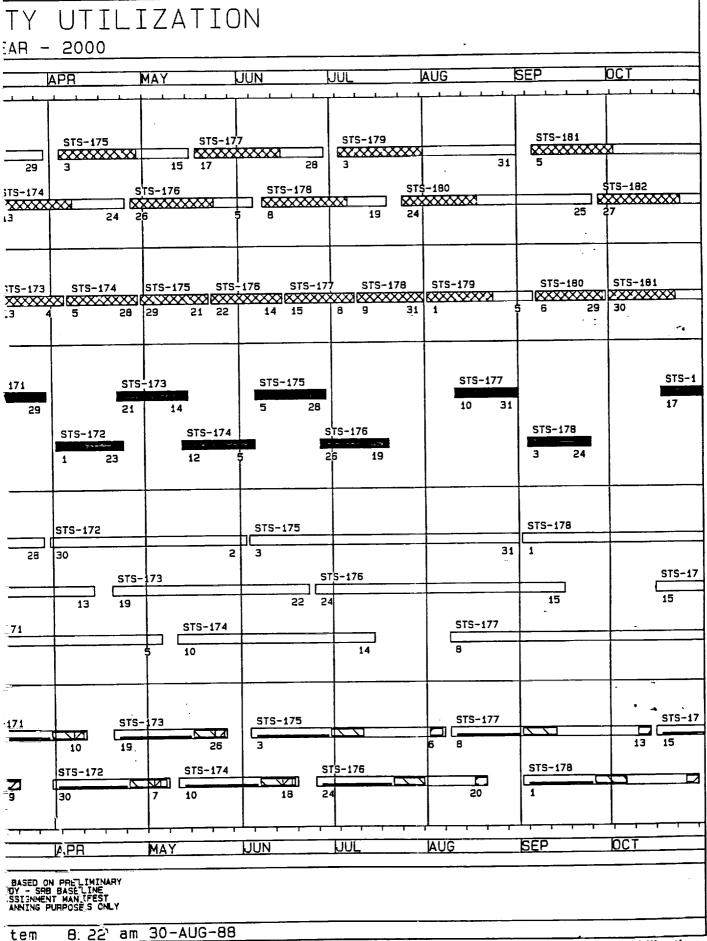


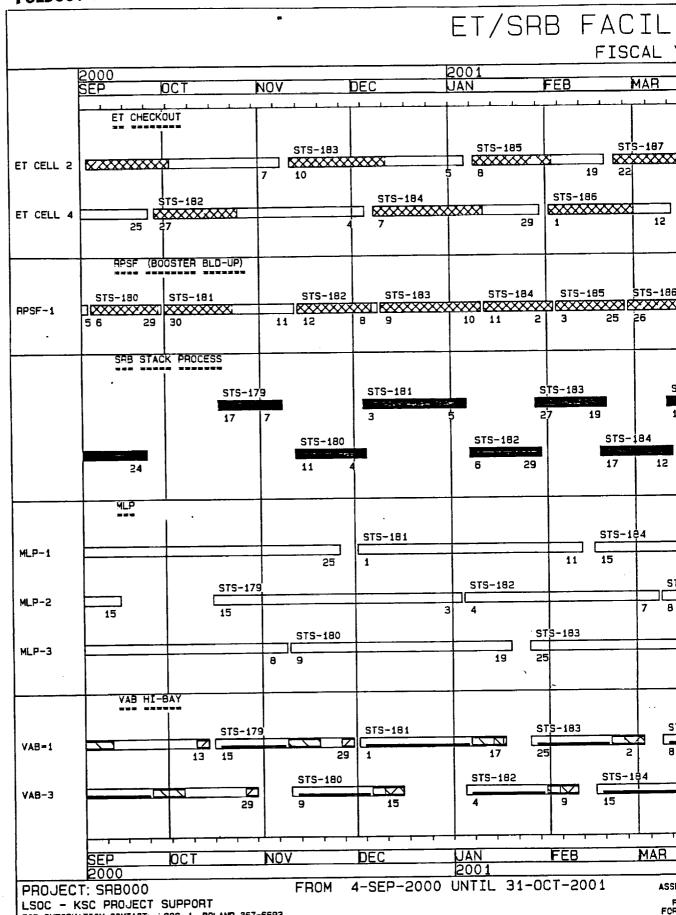
Figure 2.1-7. FY 1998 ET/SRB Facility Utilization. 5-2 10-26 1:00











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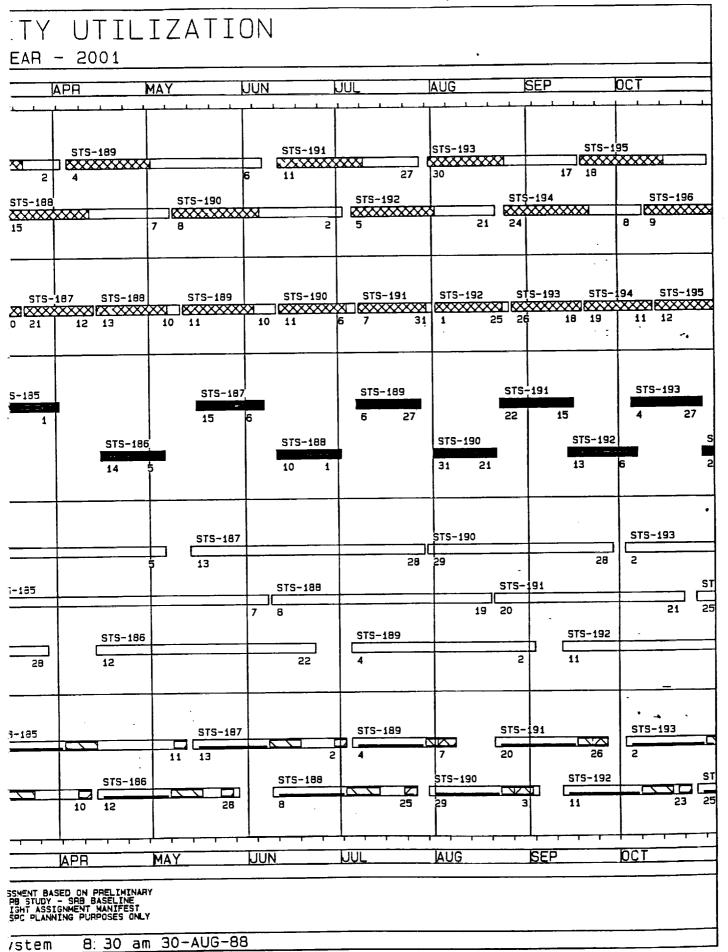


Figure 2.1-10. FY 2001 ET/SRB Facility Utilization. 5-2 10-26 1:00

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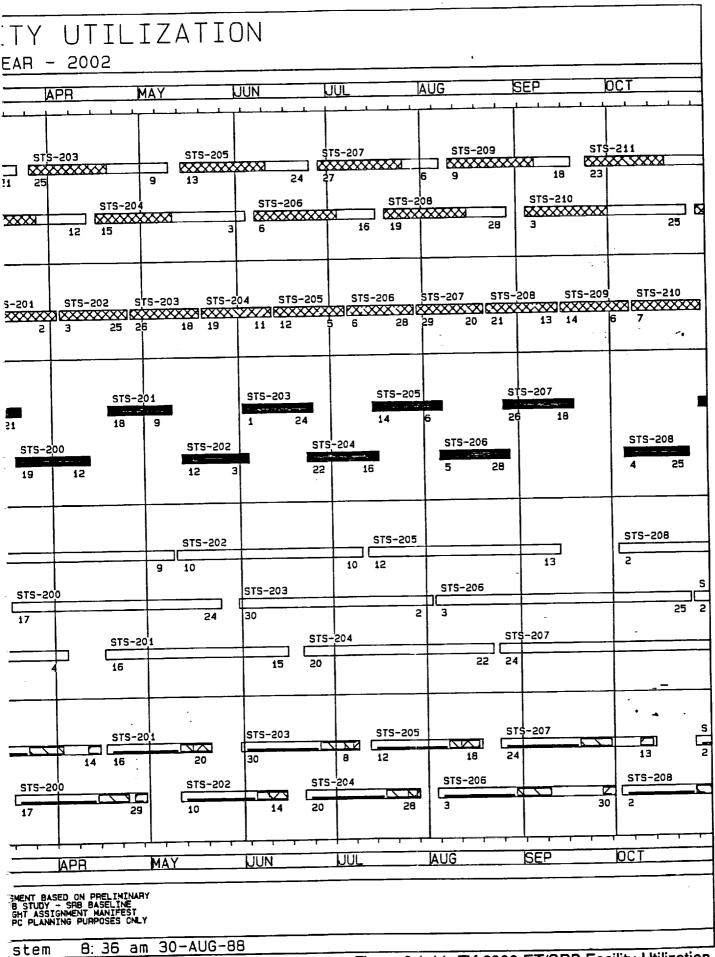
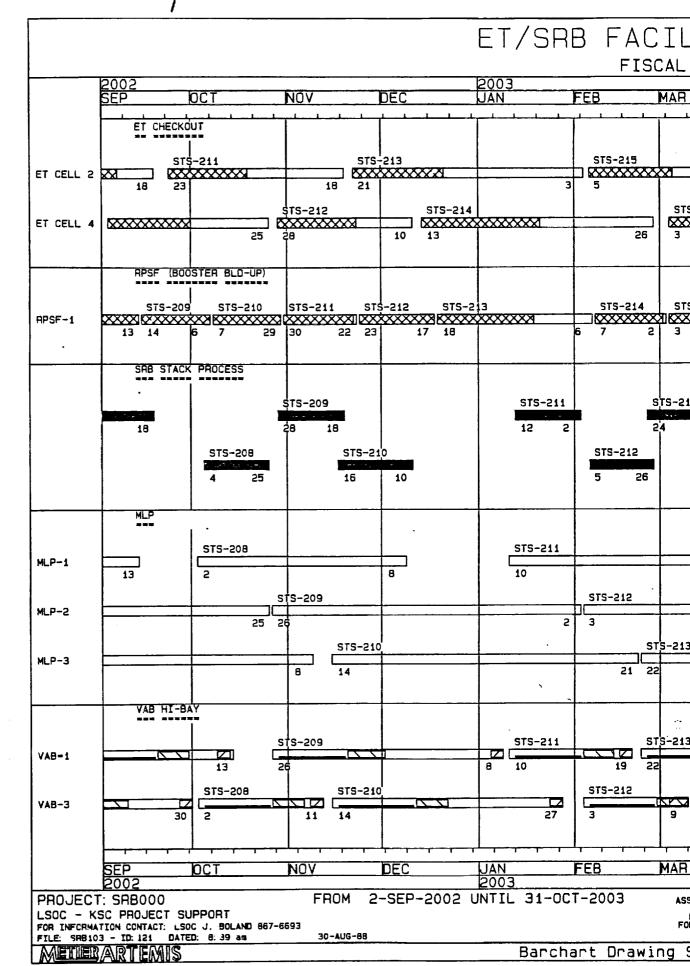


Figure 2.1-11. FY 2002 ET/SRB Facility Utilization. 5-2 10-26 1:00p



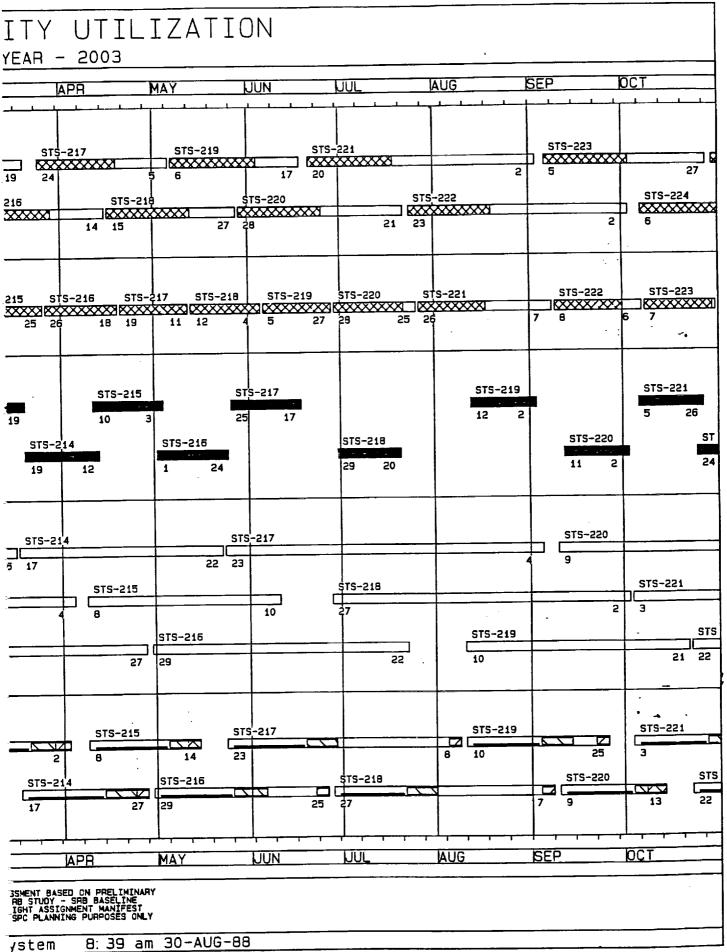


Figure 2.1-12. FY 2003 ET/SRB Facility Utilization. 5-2 10-26 1:0

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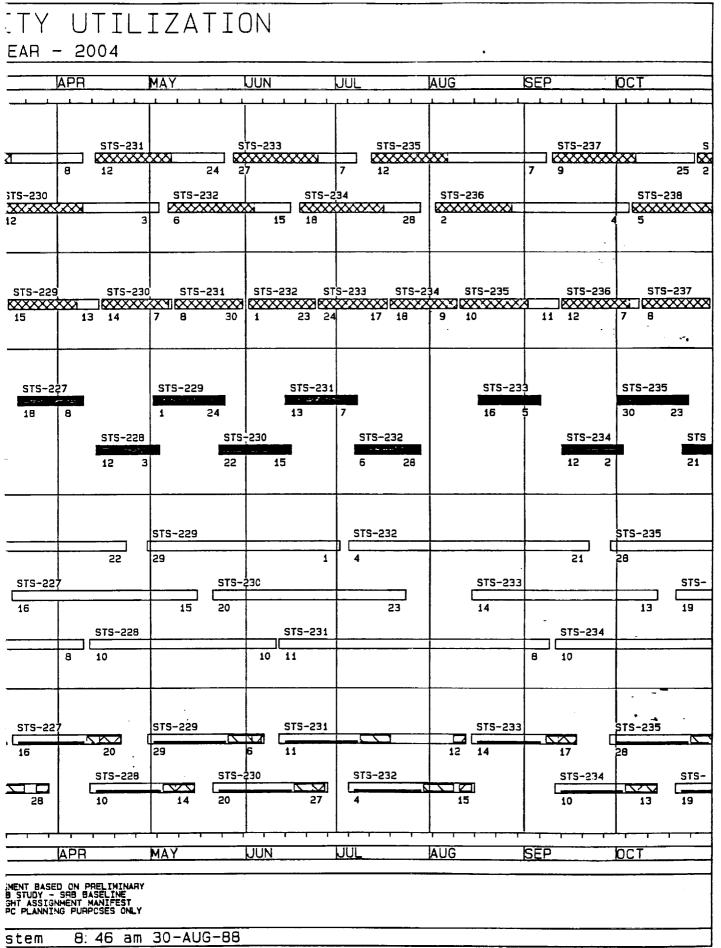
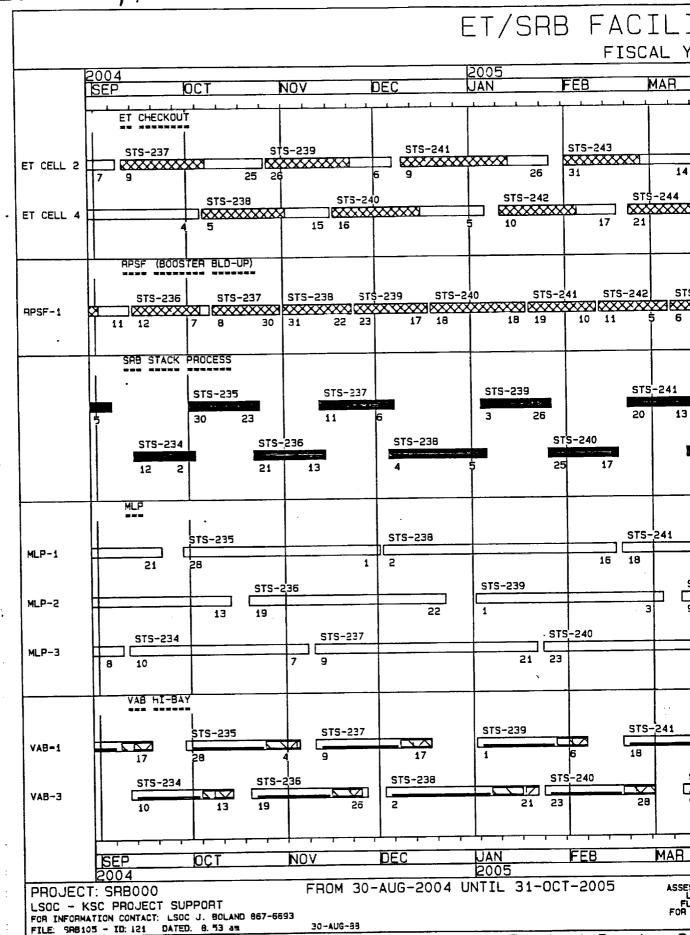


Figure 2.1-13. FY 2004 ET/SRB Facility Utilization. 5-2 10-26 1:00



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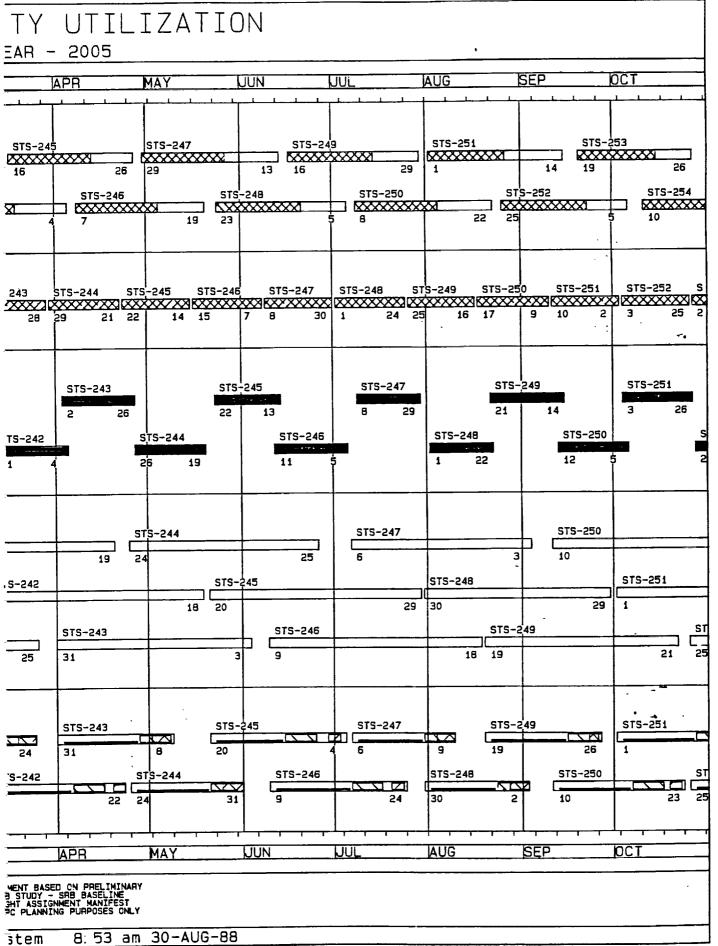
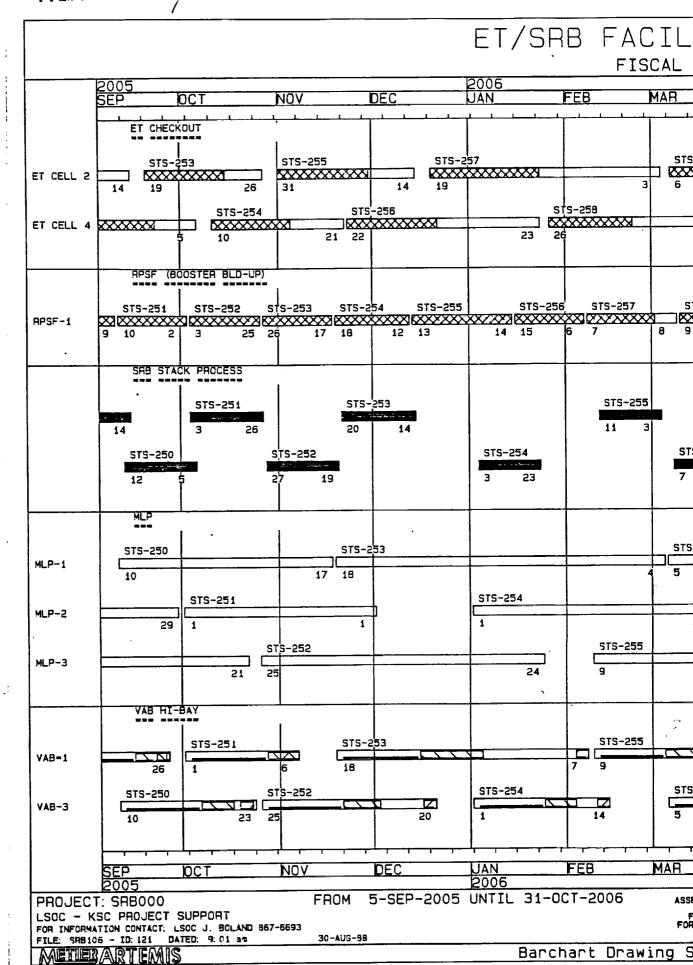
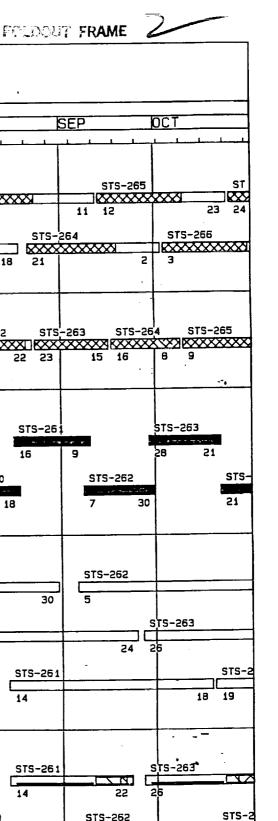


Figure 2.1-14. FY 2005 ET/SRB Facility Utilization. 5-2 10-26 1:00g

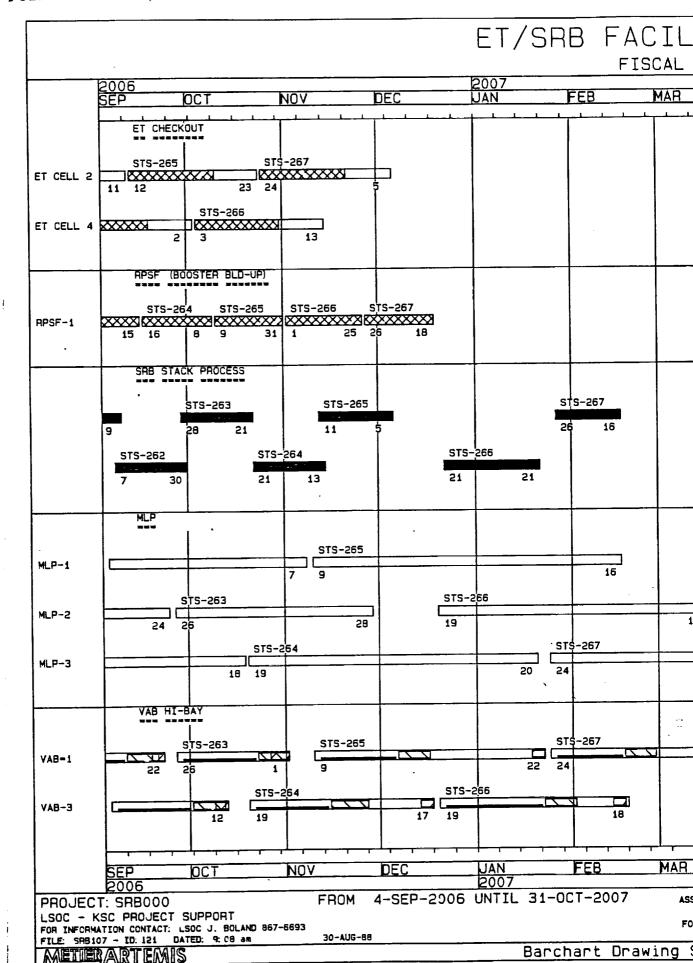




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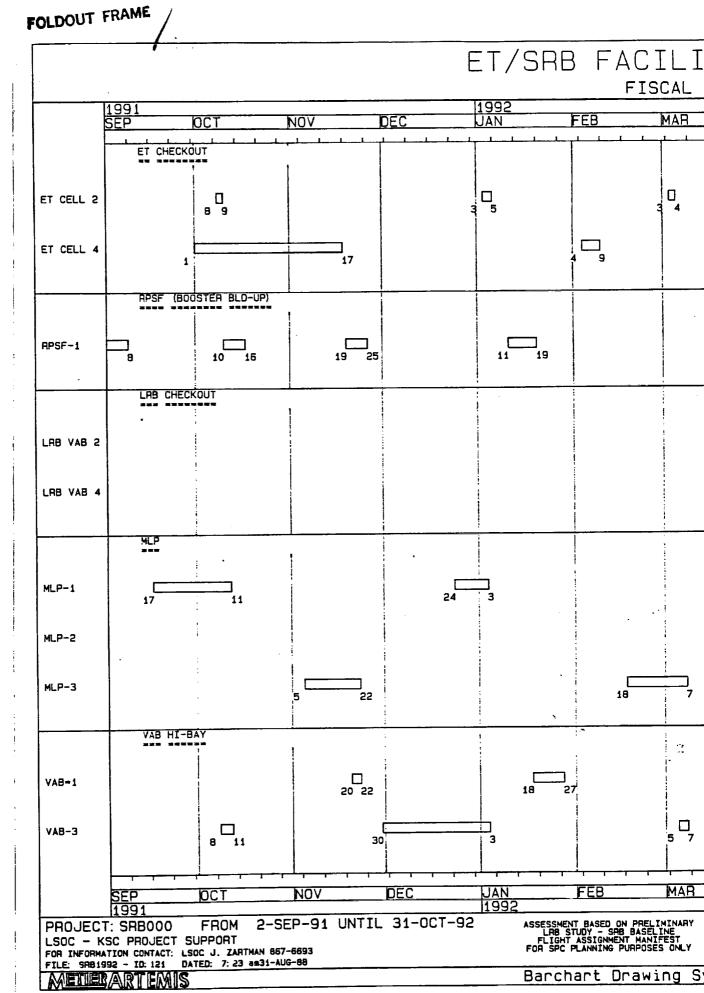
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Figure 2.1-15. FY 2006 ET/SRB Facility Utilization. 5-2 10-26 1:0



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Figure 2.1-16. FY 2007 ET/SRB Facility Utilization. 5-2 10-26 1:



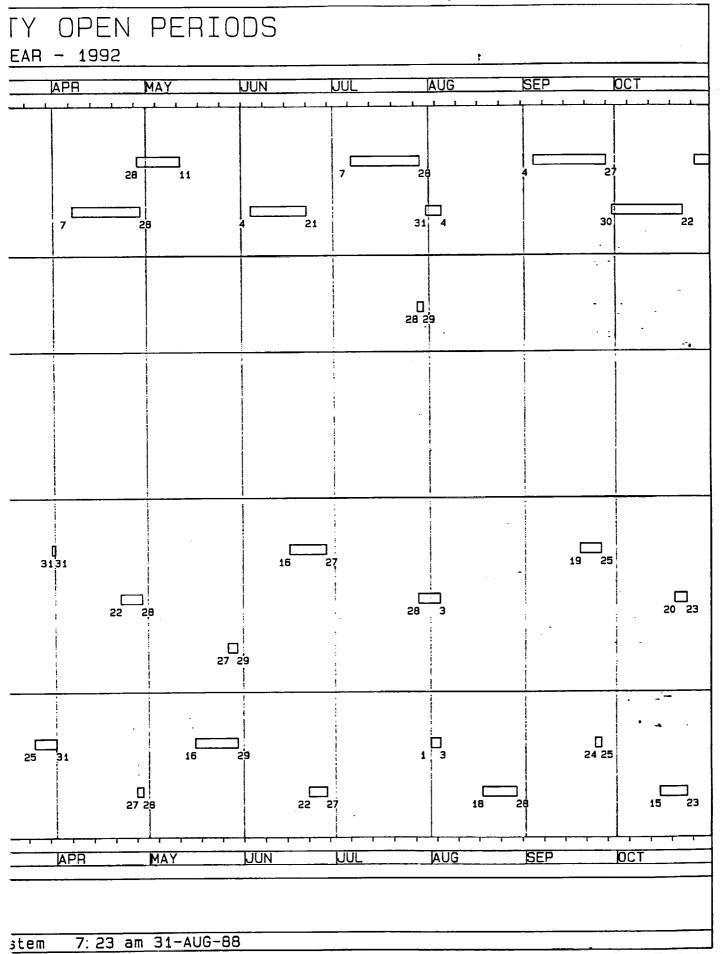
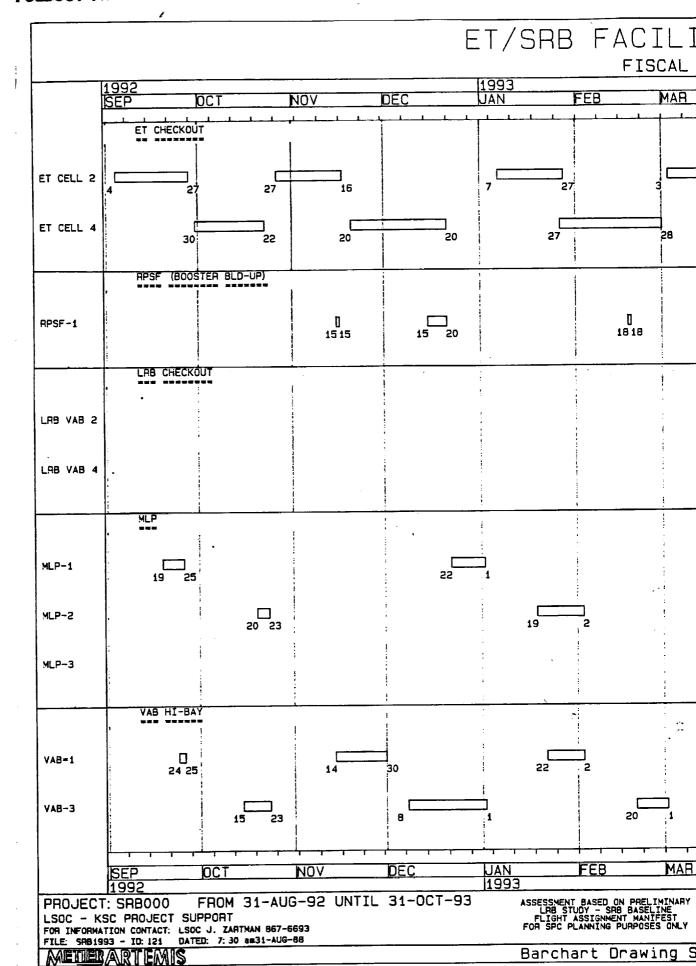


Figure 2.2-1. FY1992 ET/SRB Facility Open Periods. | 5-2 10/26 1:00|



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Figure 2.2-2. FY1993 ET/SRB Facility Open Periods. 5-2 10/26 1:00

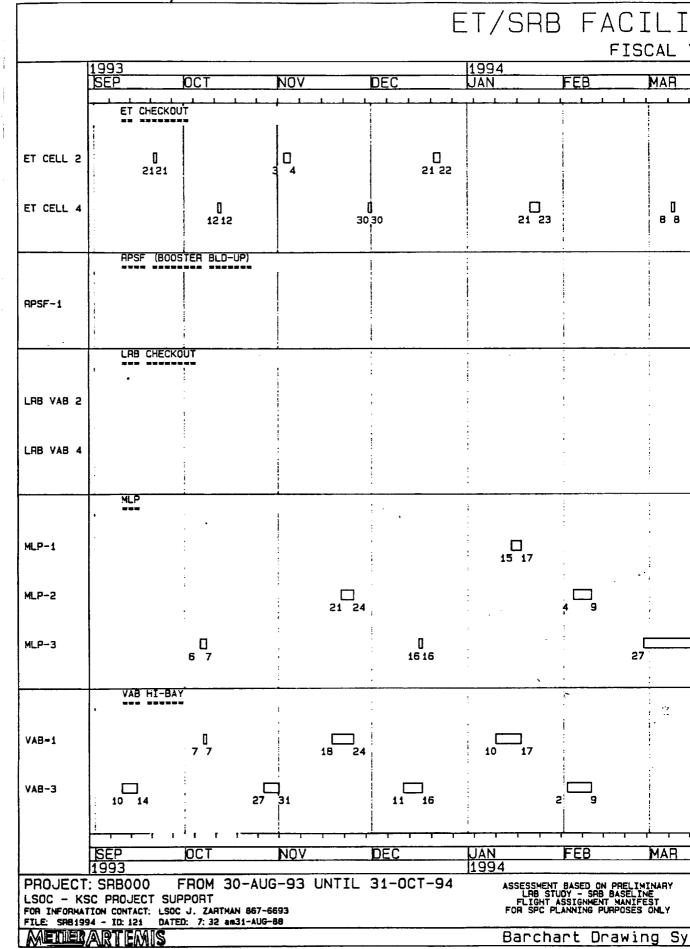
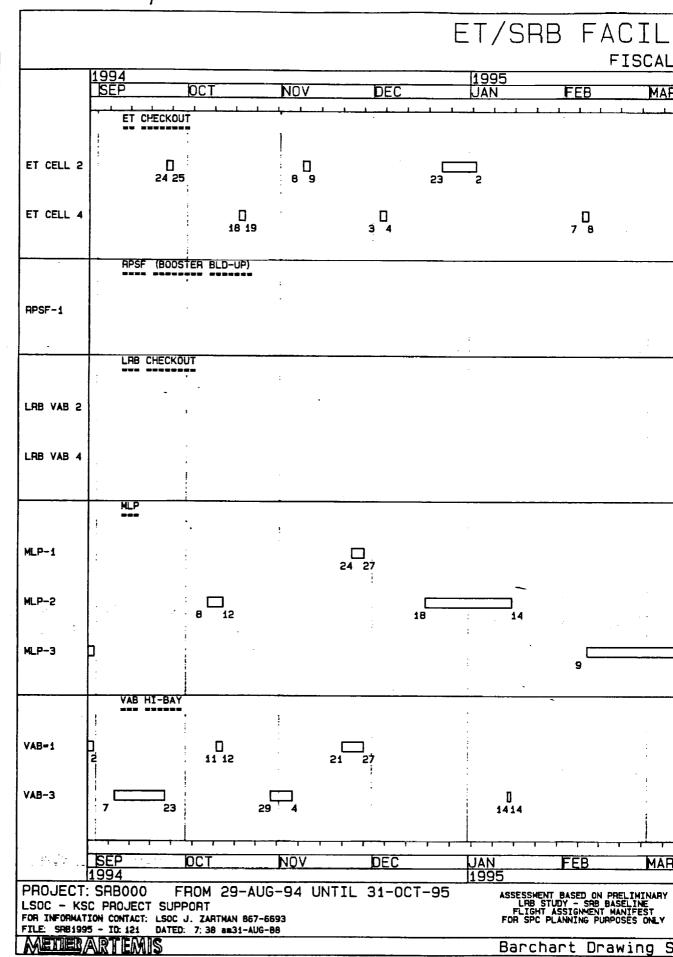


Figure 2.2-3. FY1994 ET/SRB Facility Open Periods. 5-2 10/26 1:00p



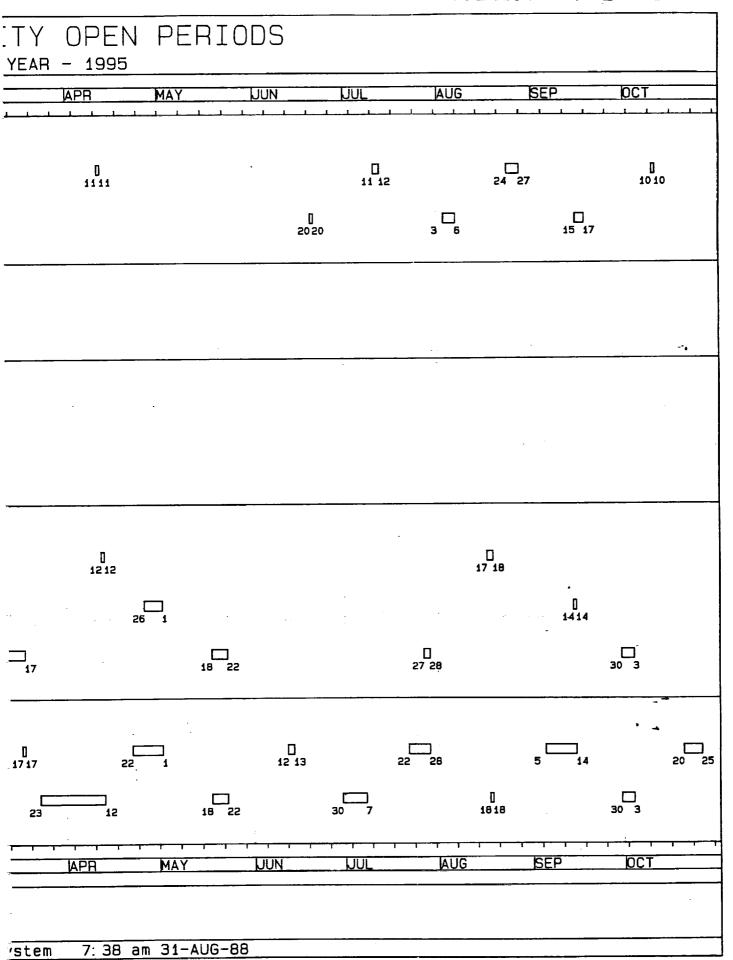


Figure 2.2-4. FY1995 ET/SRB Facility Open Periods. 5-2 10/26 1:0

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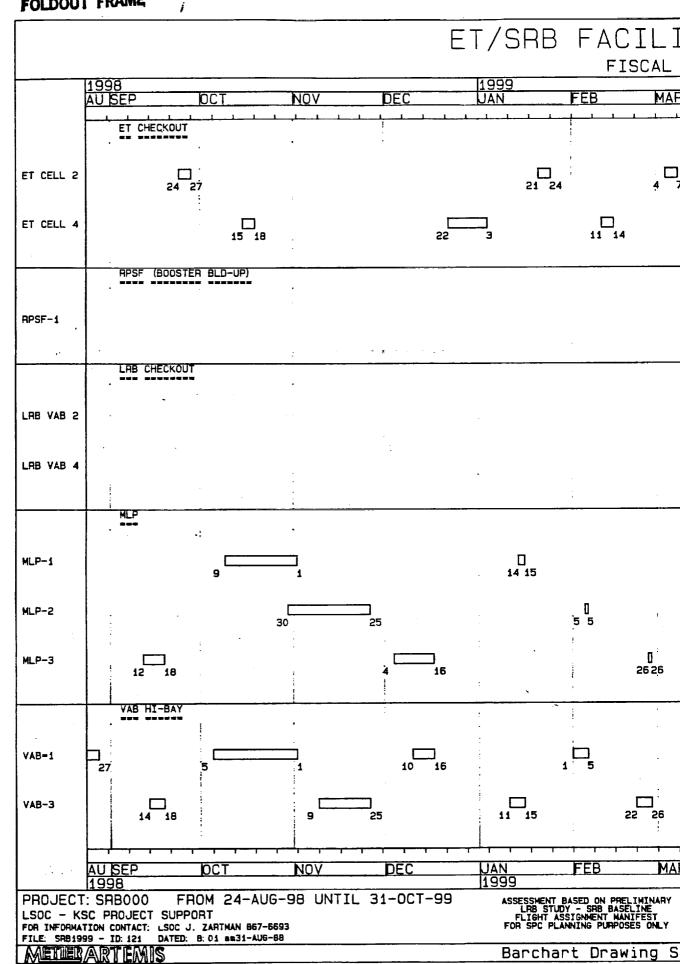
Figure 2.2-5. FY1996 ET/SRB Facility Open Periods. 5-2 10/26 1:00

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Figure 2.2-6. FY1997 ET/SRB Facility Open Periods. 5-2 10/26 1:00



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Figure 2.2-8. FY1999 ET/SRB Facility Open Periods. 5-2 10/26 1:00

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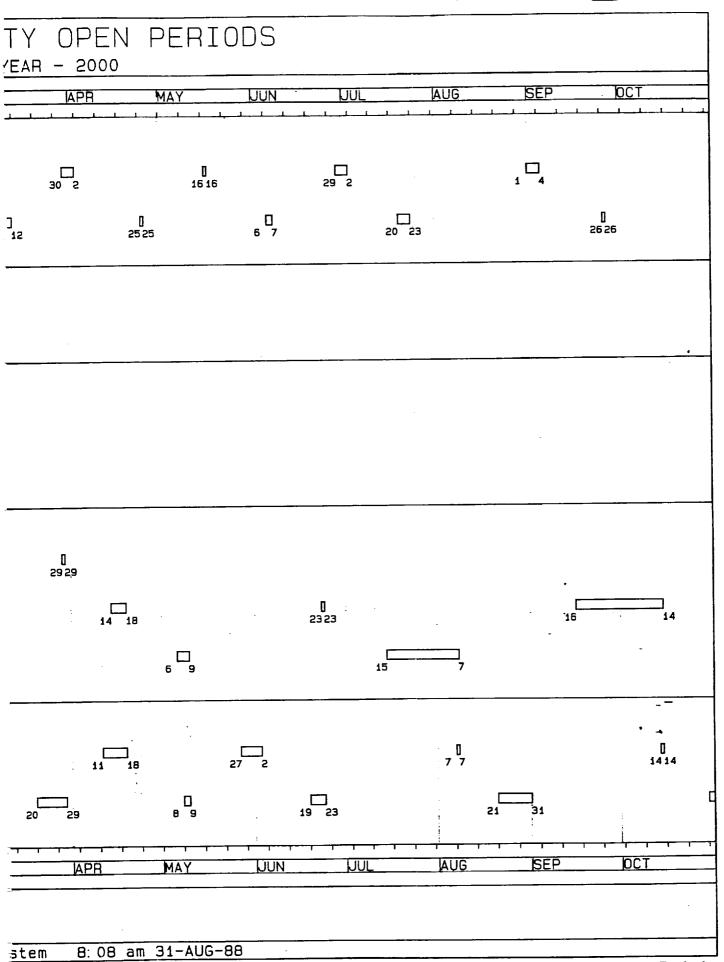
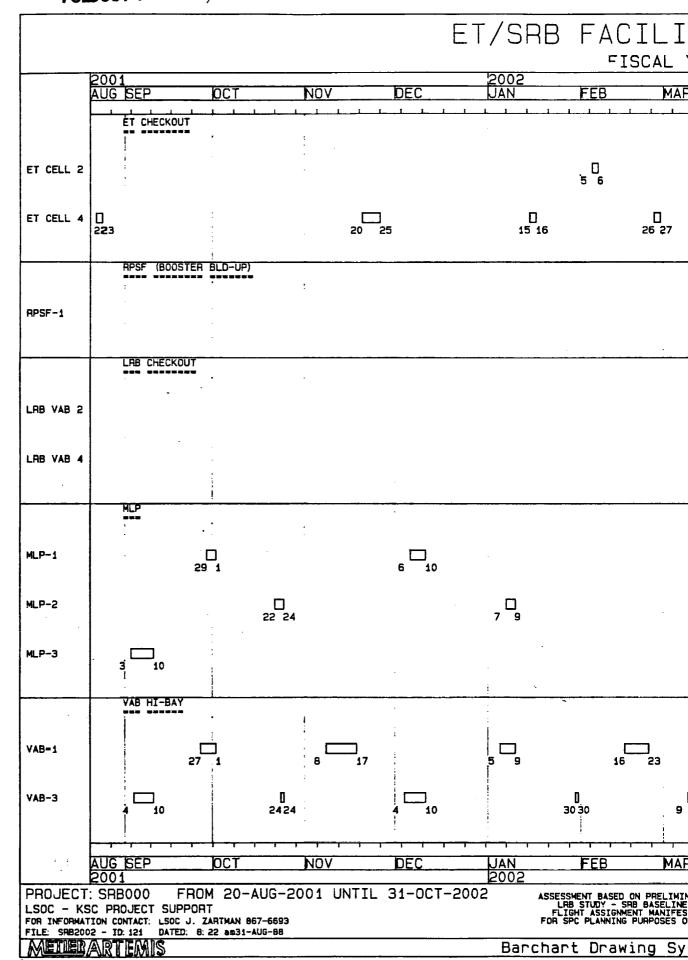


Figure 2.2-9. FY2000 ET/SRB Facility Open Periods. 5-2 10/26 1:00

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Figure 2.2-10. FY2001 ET/SRB Facility Open Periods. 5-2 10/26 1:00p



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Figure 2.2-11. FY2002 ET/SRB Facility Open Periods. 5-2 10/26 1:00p

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FOR INFORMATION CONTACT: LSCC J. ZARTMAN 867-6593
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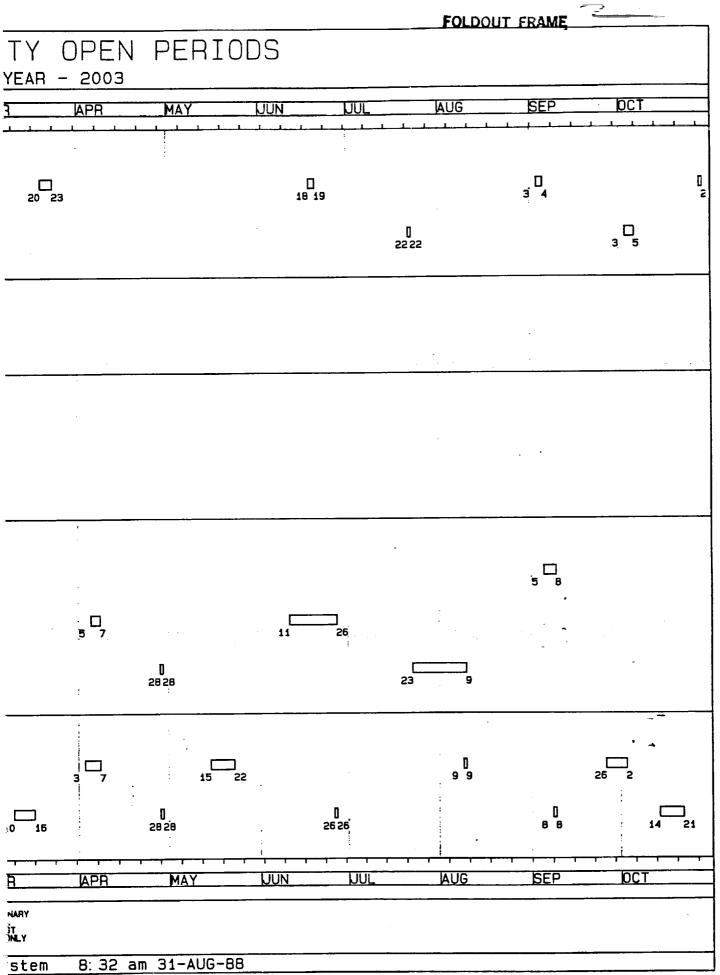


Figure 2.2-12. FY2003 ET/SRB Facility Open Periods. 5-2 10/26 1:00

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Figure 2.2-13. FY2004 ET/SRB Facility Open Periods. 5-2 10/26 1:00p

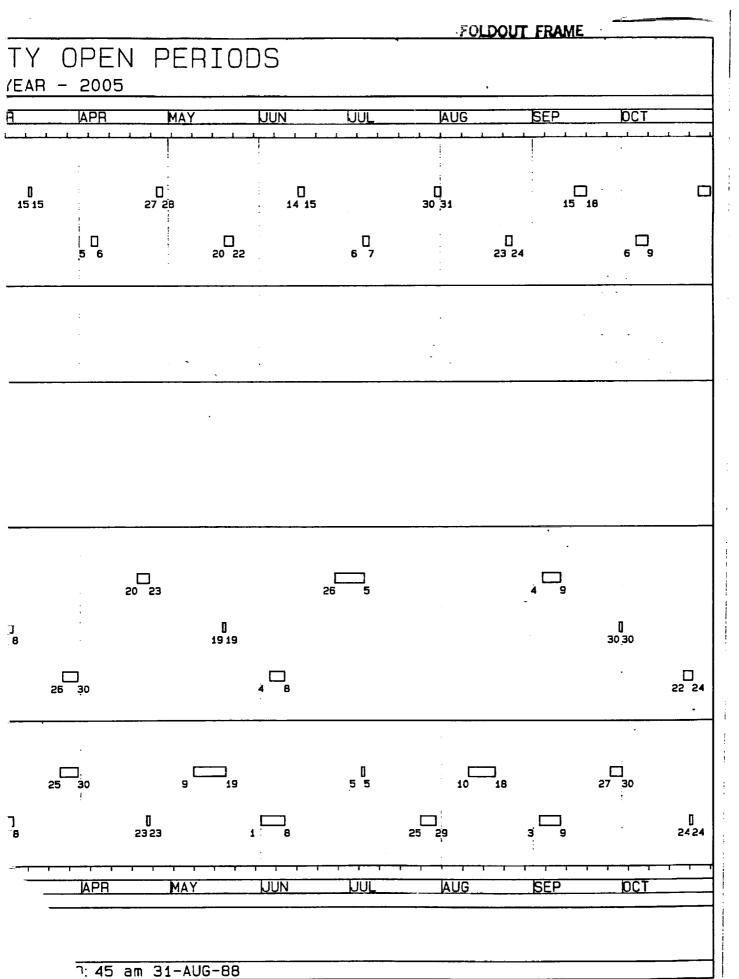


Figure 2.2-14. FY2005 ET/SRB Facility Open Periods. 5-2 10/26 1:00p

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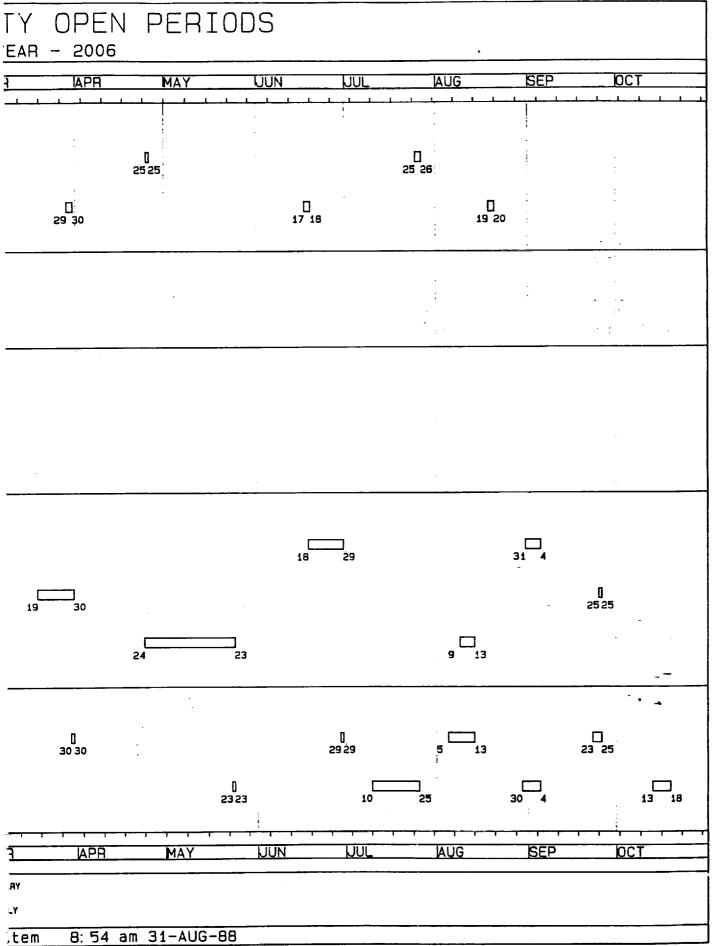
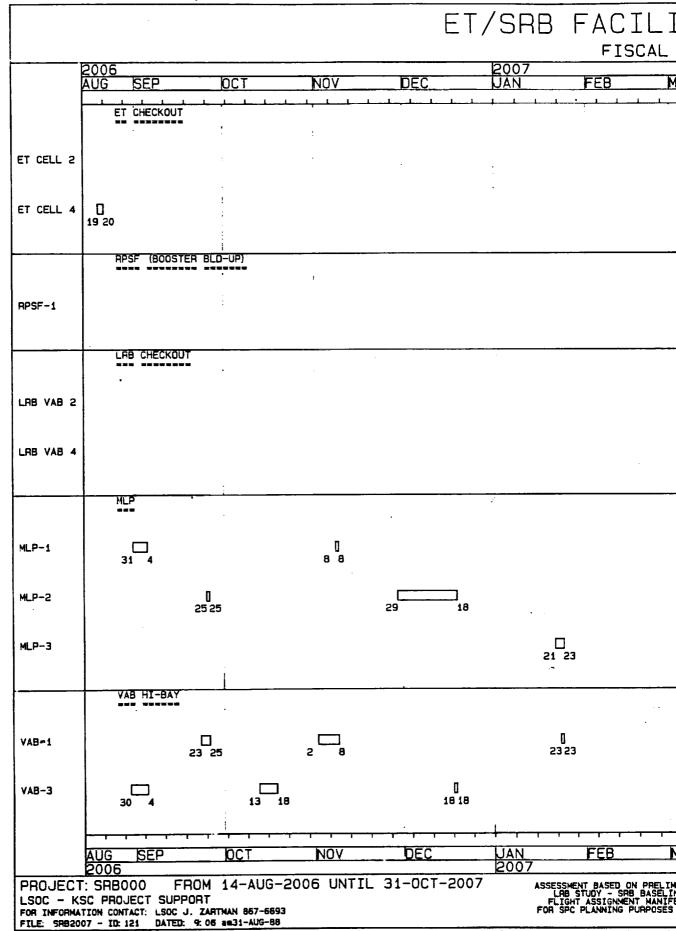


Figure 2.2-15. FY2006 ET/SRB Facility Open Periods. 5-2 10/26 1:00p



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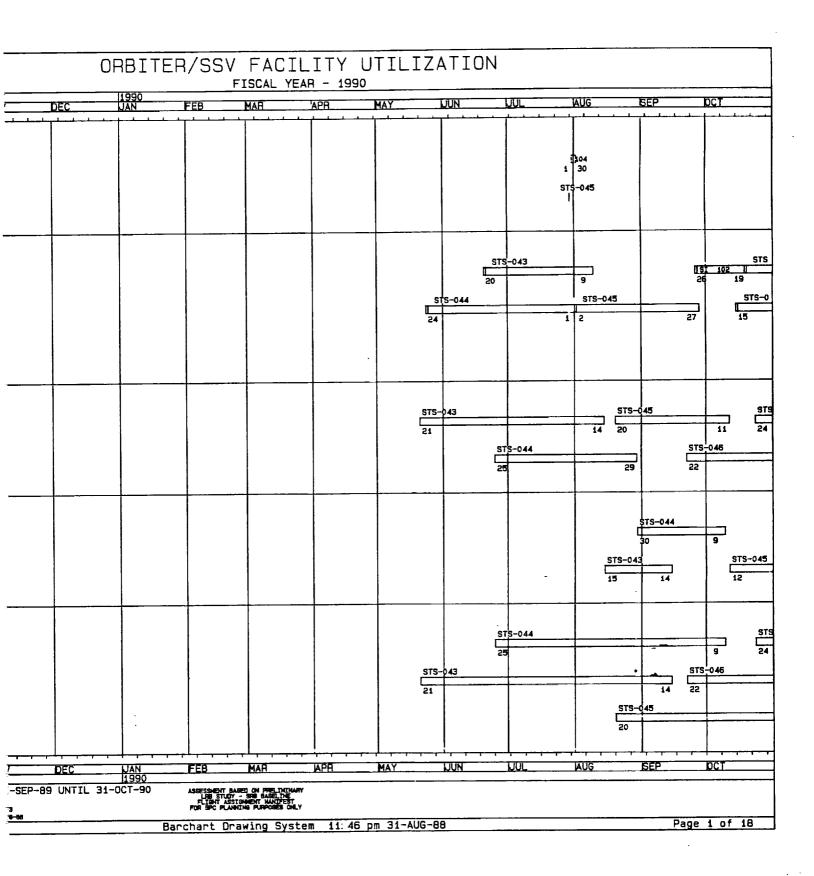


Figure 2.3-1 FY1990 Orbiter/SSV Facility Utilization

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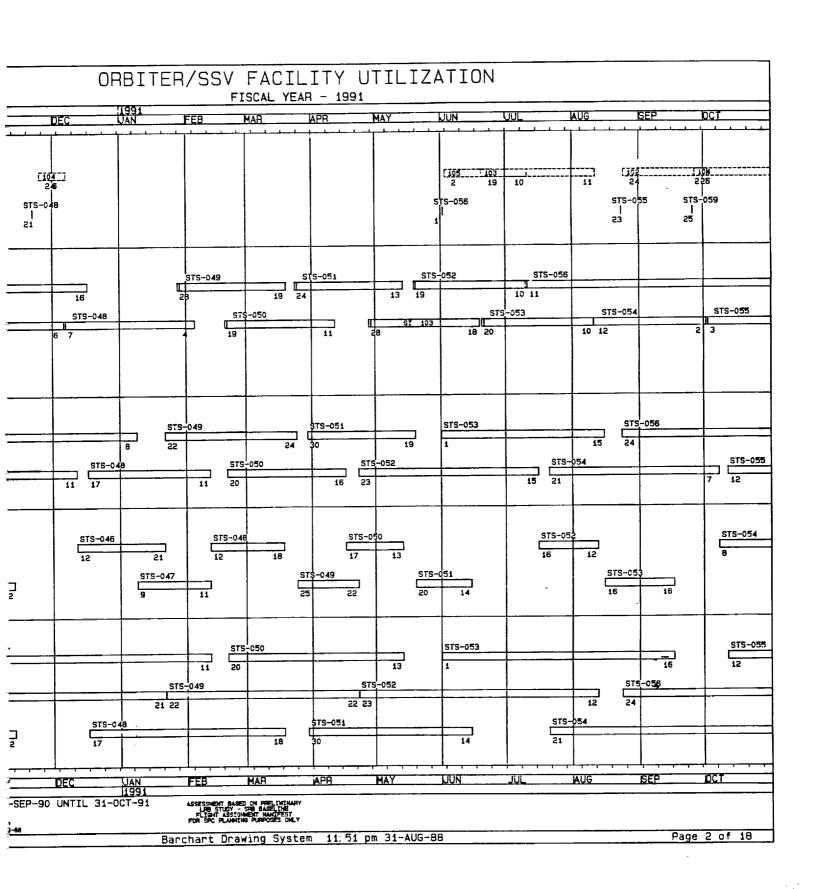


Figure 2.3-2 FY1991 Orbiter/SSV Facility Utilization

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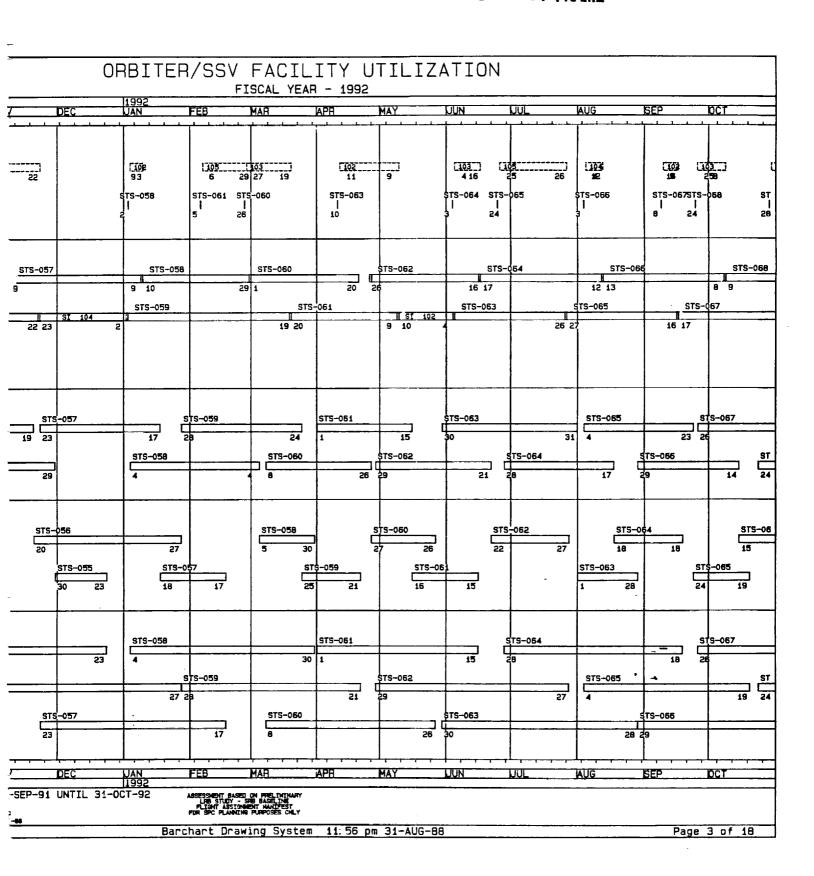
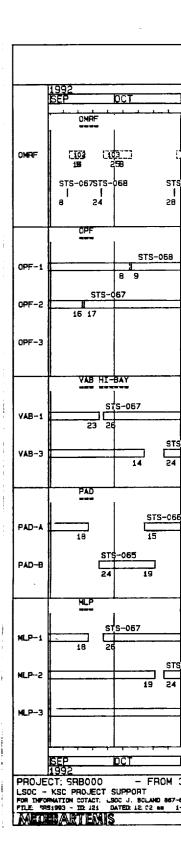


Figure 2.3-3 FY1992 Orbiter/SSV Facility Utilization



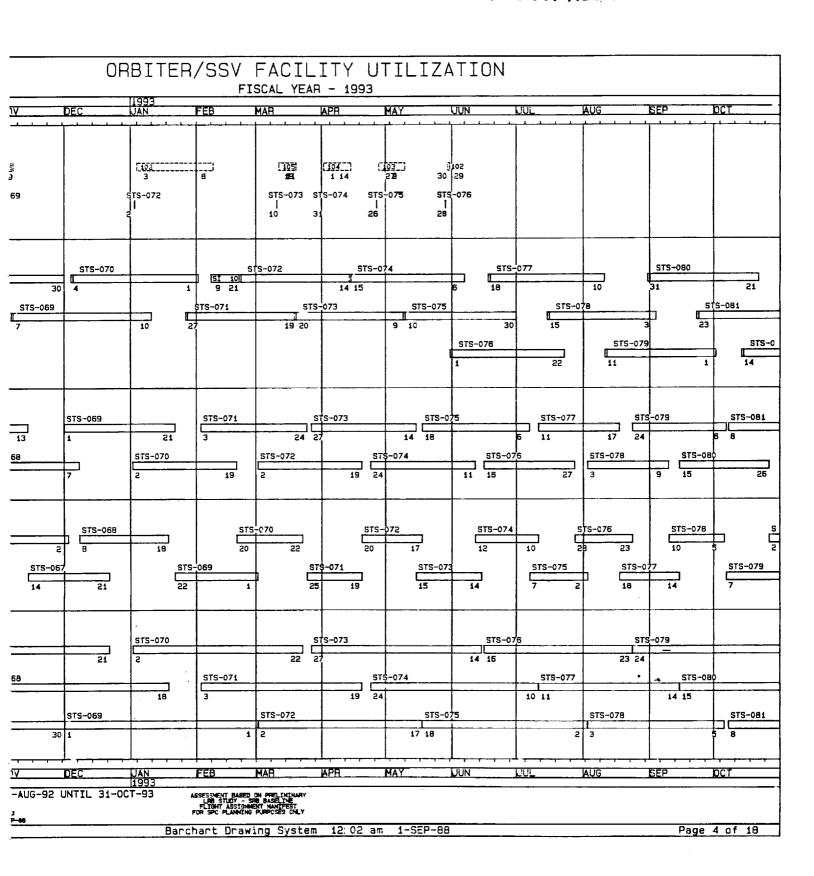


Figure 2.3-4 FY1993 Orbiter/SSV Facility Utilization

OMPF OMRF STS-080 0PF-1 21 sts-081 0PF-2 1 0PF-3 VAB HI-BAY STS-081 VAB-1 VAB-3 26 PAD STS-078 PAD-A 10 PAD-B MLP MLP-1 MLP-2 14 15 PROJECT: SRB000 - FROM
LSOC - KSC PROJECT SUPPORT
FOR DIFFERMATION CORTACT: LSOC J. BOLAND SET
FILE: SRS1984 - ID: 121 DATED: 12: D8 as

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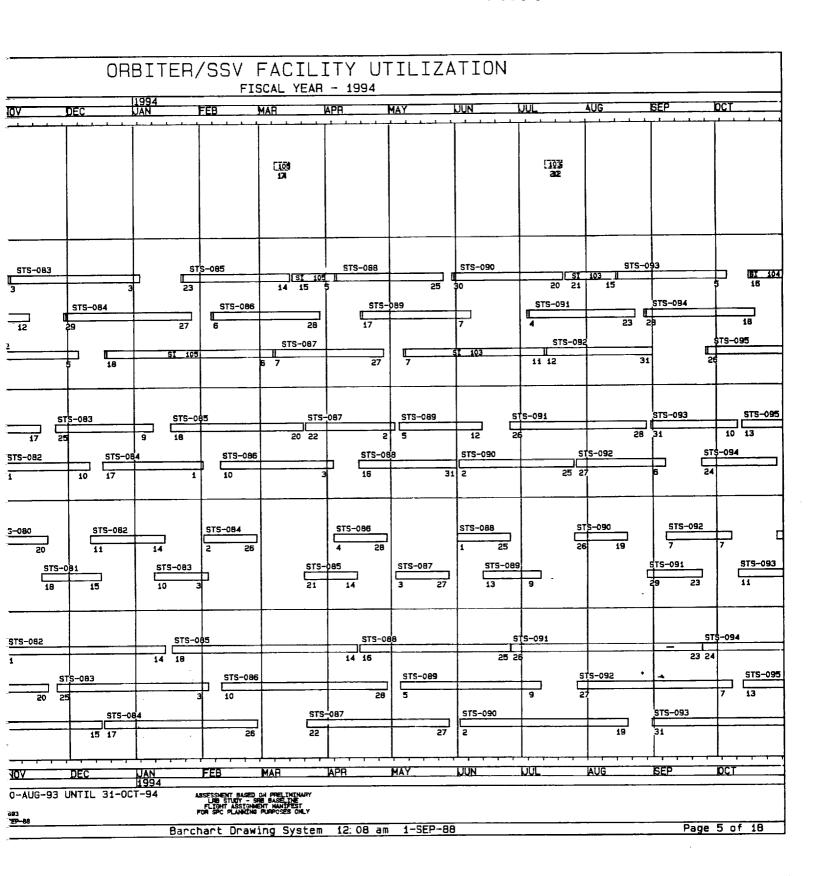


Figure 2.3-5 FY1994 Orbiter/SSV Facility Utilization

OMRE OMRE CPF OPF-1 16 0PF-2 \$TS-095 0PF-3 VAB HI-BAY STS-095 VAB-1 ST\$-094 VAB-3 24 PAD PAD-A STS-093 PAD-B 23 HLP ST\$-094 MLP-1 23 24 STS-095 MLP-2 MLP-3 SEP DCT N 1994
PROJECT: SRB000 - FROM
LSDC - KSC PROJECT SUPPORT
FOR INFORMATION COTACT: LSDC J. BOLAND 867FILE 'SRI'995 - ID: 121 DATED: 12 14 as

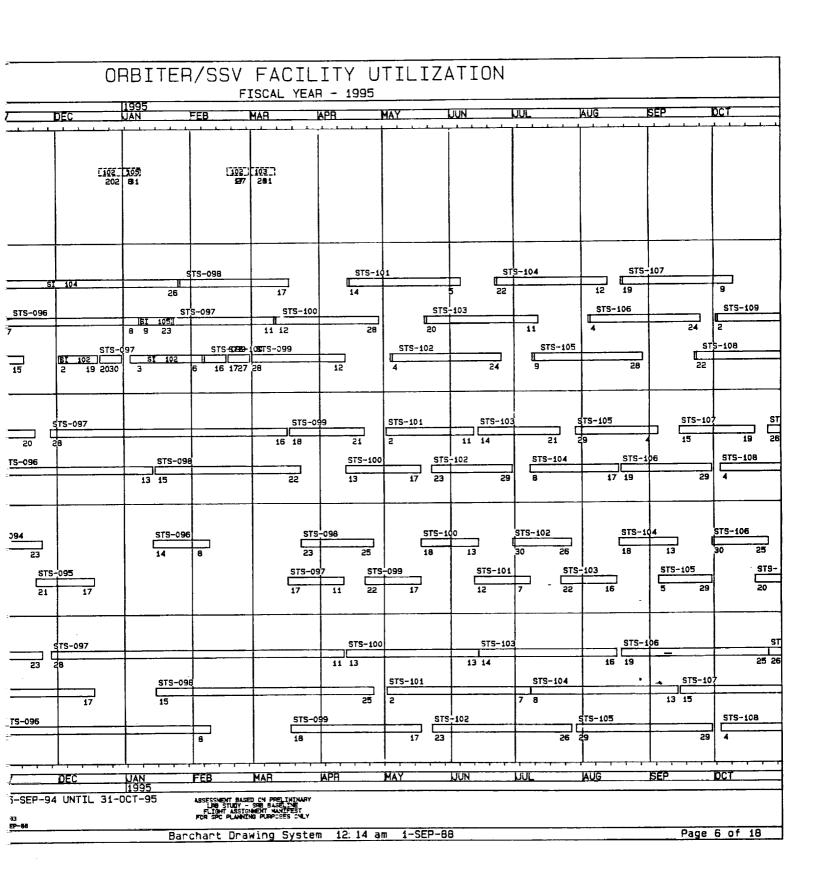


Figure 2.3-6 FY1995 Orbiter/SSV Facility Utilization

OMRF OMRF 0PF-1 STS-109 0PF-2 ST5-108 0PF-3 VAB HI-BAY VAB-1 STS-108 VAB-3 29 PAD STS-106 PAD-A 13 25 PAD-8 MLP MLP-1 13 15 MLP-3 SEP DCT
1995
PROJECT: SRB000 - FROM
LSOC - KSC PROJECT SUPPORT
FOR THE SRS 1996 - TE 121 DATED: 12 20 as

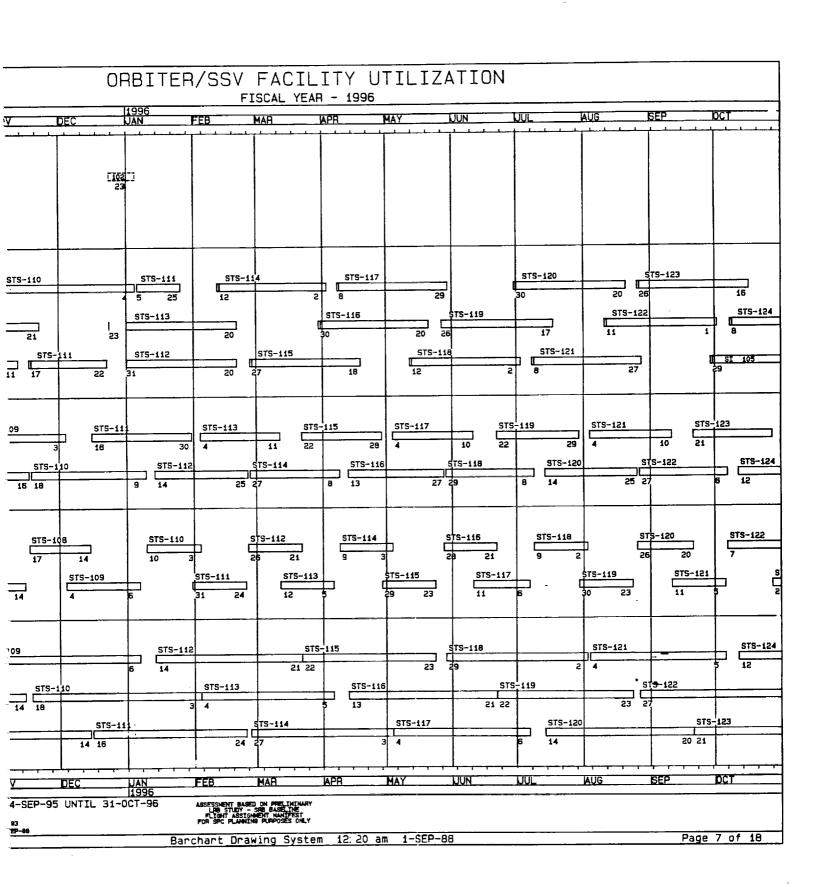


Figure 2.3-7 FY1996 Orbiter/SSV Facility Utilization

OMRF OPF OPF-1 16 STS-124 0PF-2 SI 105 0PF-3 VAB HI-BAY VAB-1 VAB-3 PAD STS-122 PAD-A 20 STS-121 PAD-B MLP STS-124 12 MLP-1 MLP-5 31 STS-123 MLP-3 20 21 SEP DCT
1995
PROJECT: SRB000 - FROM
LSOC - KSC PROJECT SUPPORT
FOR INFORMATION COTACT: LSOC J. SOLAND 867FILE SRS1997 - ID. 121 DATED 12: 26 se 1

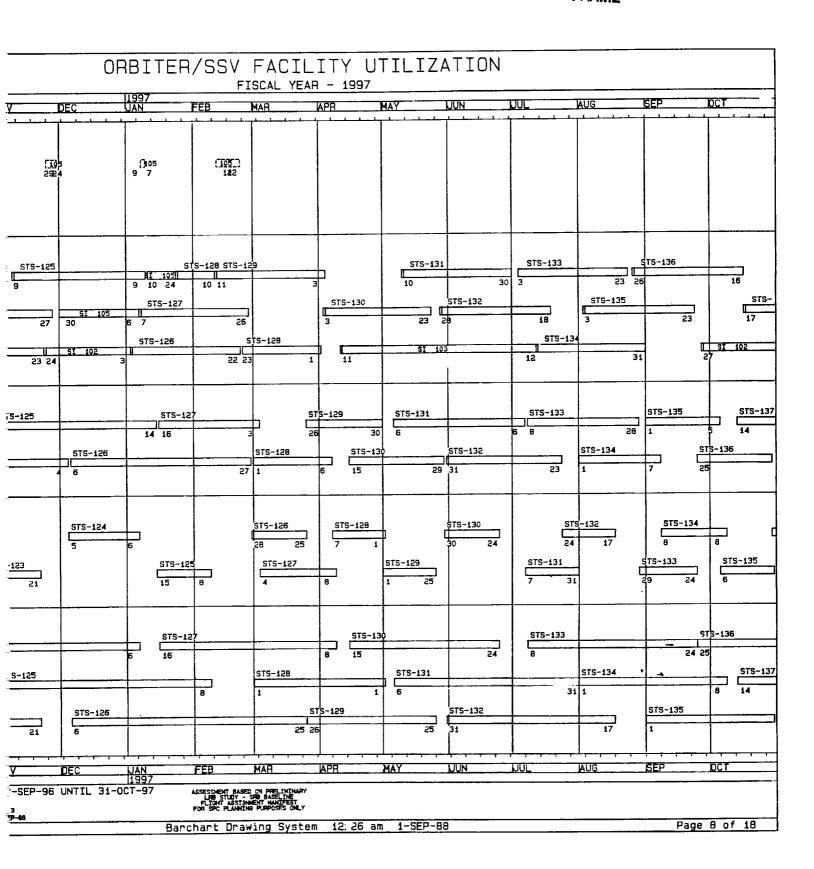
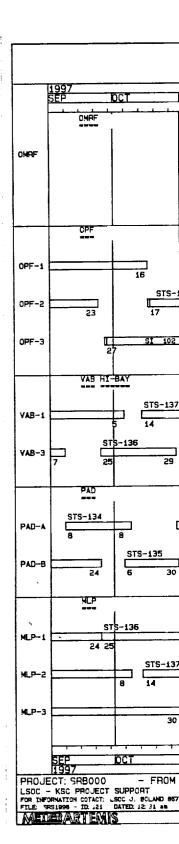


Figure 2.3-8 FY1997 Orbiter/SSV Facility Utilization



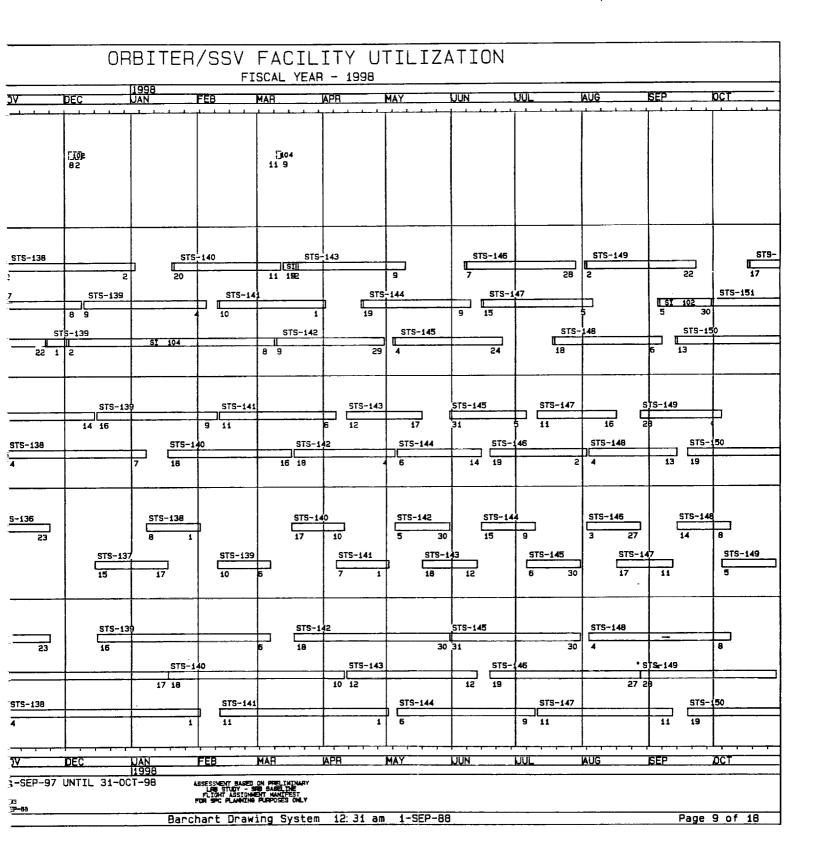


Figure 2.3-9 FY1998 Orbiter/SSV Facility Utilization

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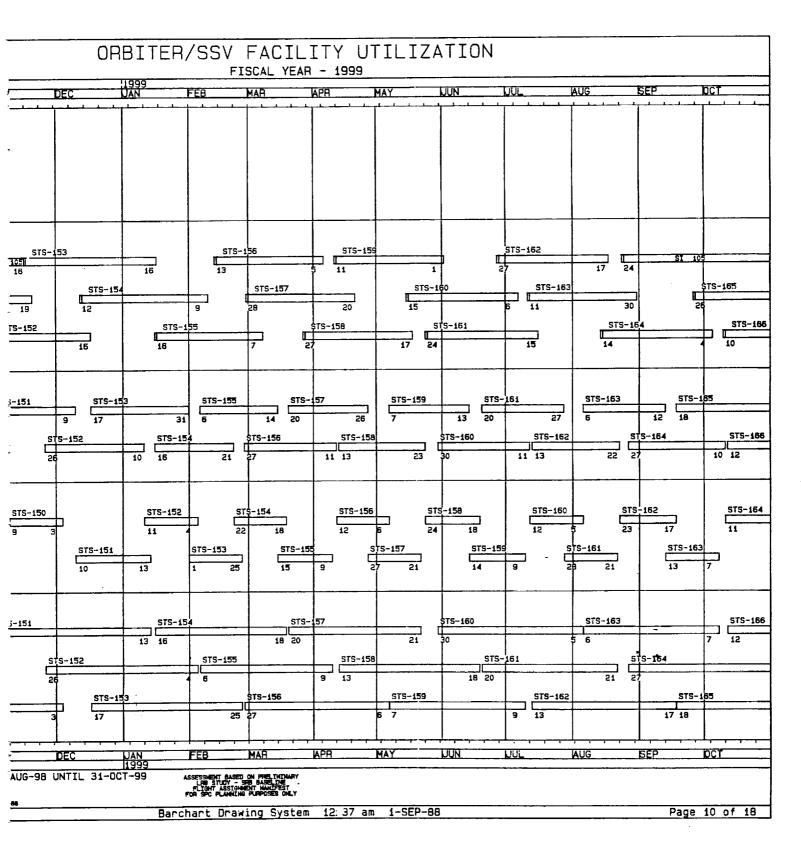


Figure 2.3-10 FY1999 Orbiter/SSV Facility Utilization

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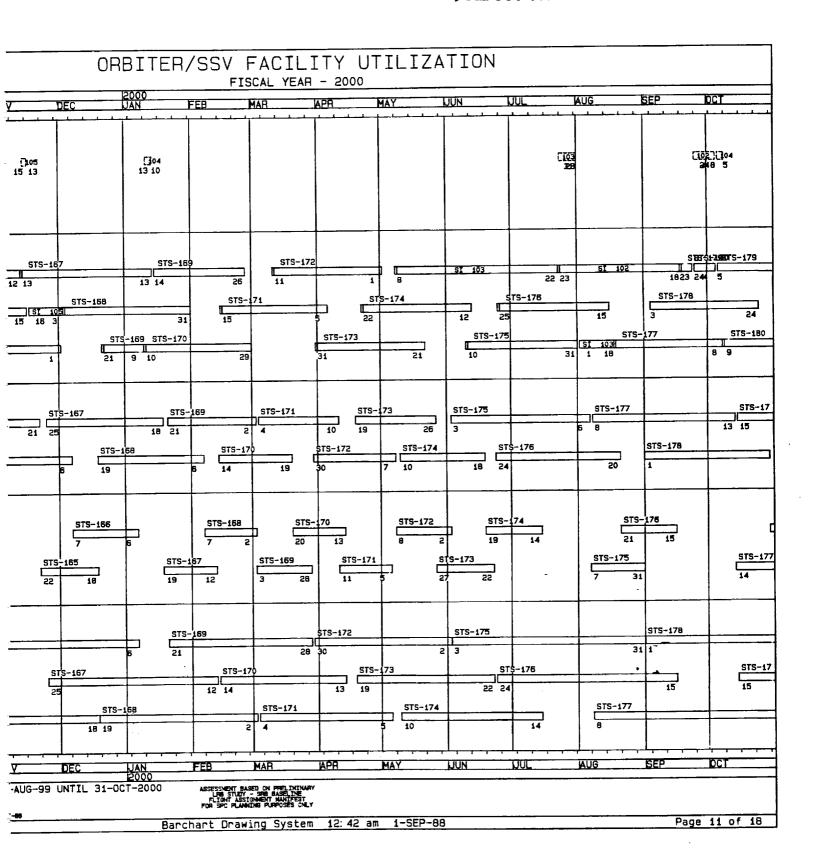
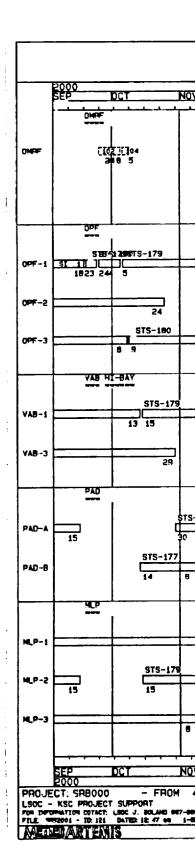


Figure 2.3-11 FY2000 Orbiter/SSV Facility Utilization



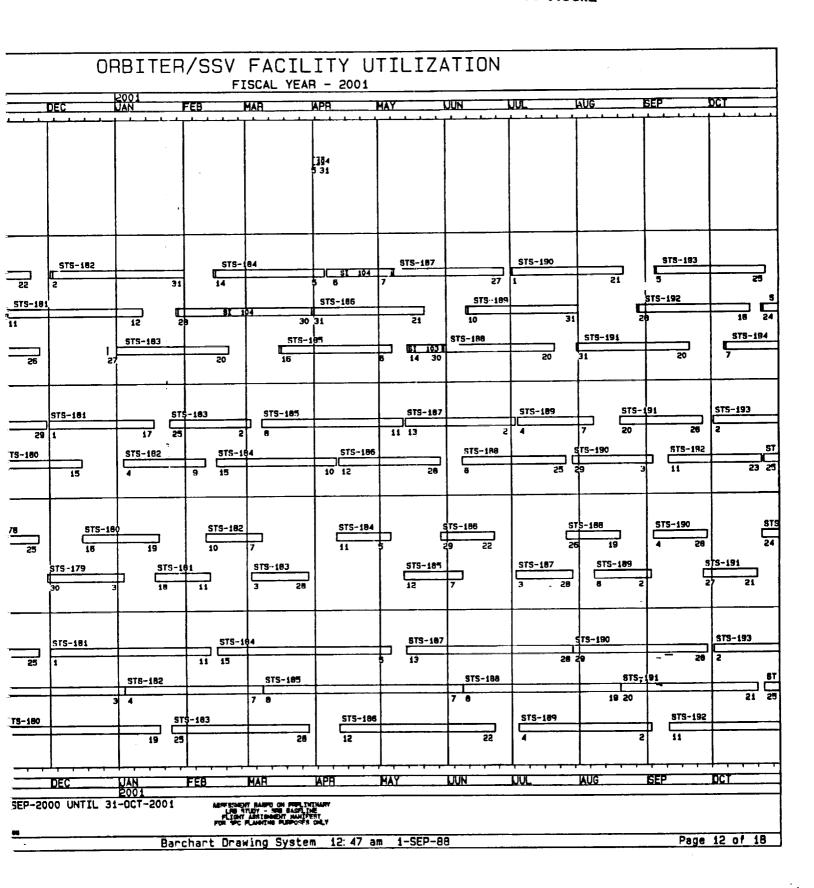
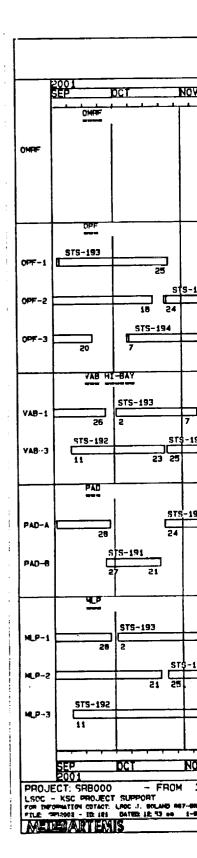


Figure 2.3-12 FY2001 Orbiter/SSV Facility Utilization



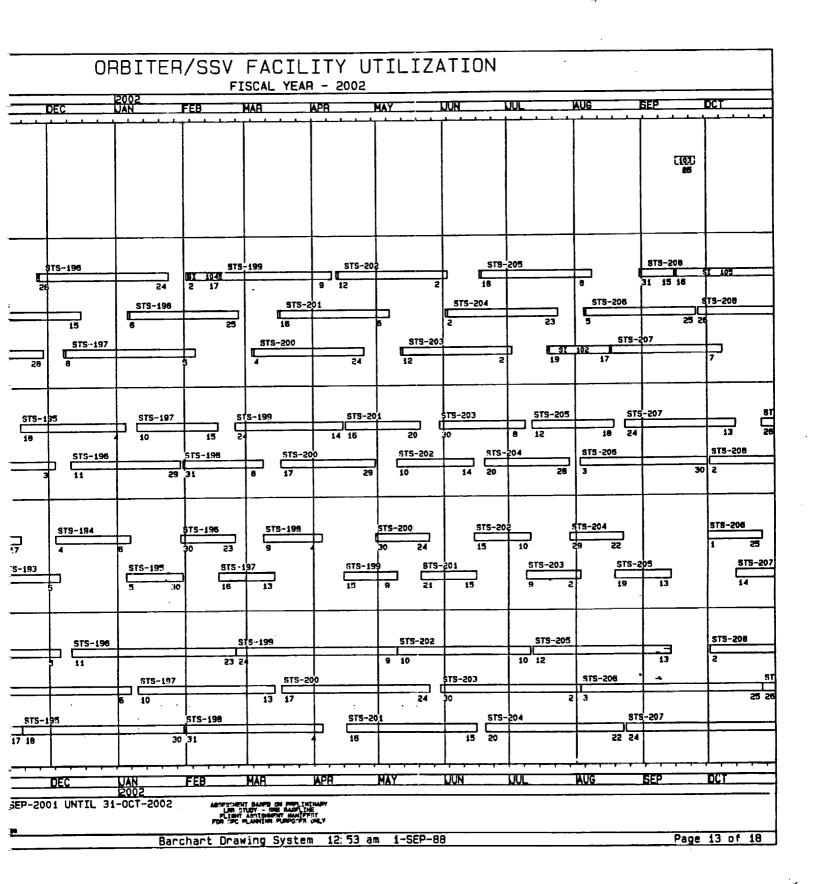


Figure 2.3-13 FY2002 Orbiter/SSV Facility Utilization

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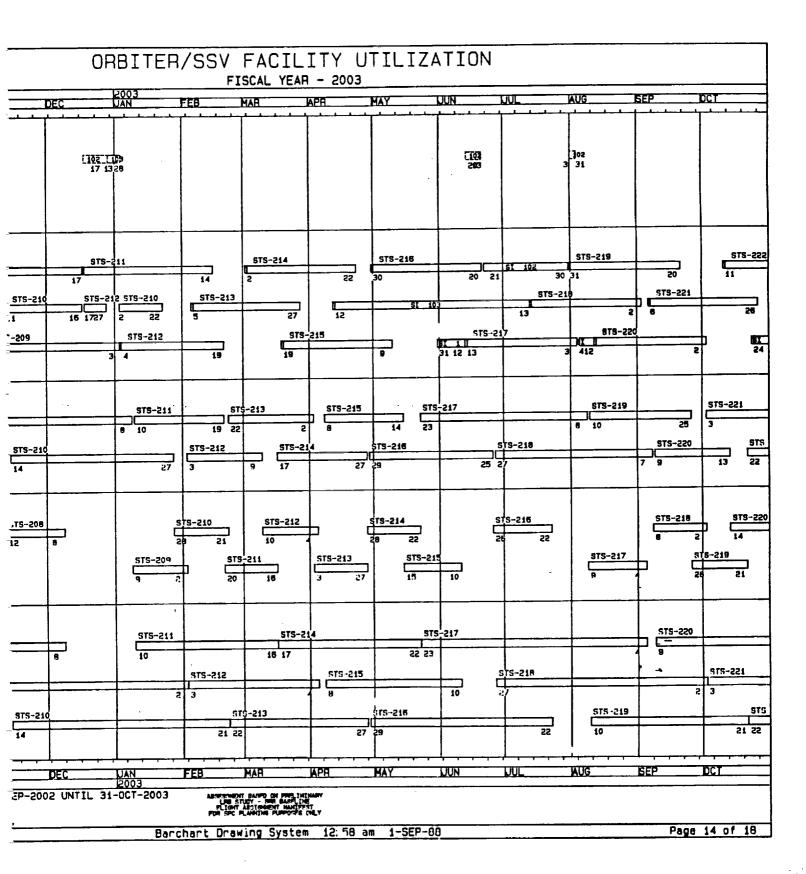
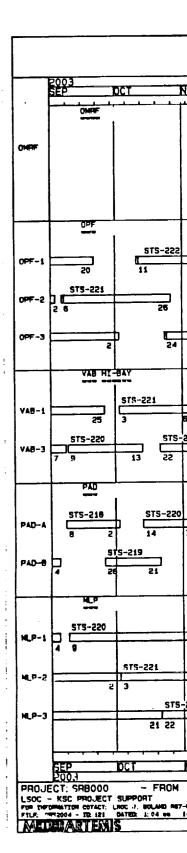


Figure 2.3-14 FY2003 Orbiter/SSV Facility Utilization





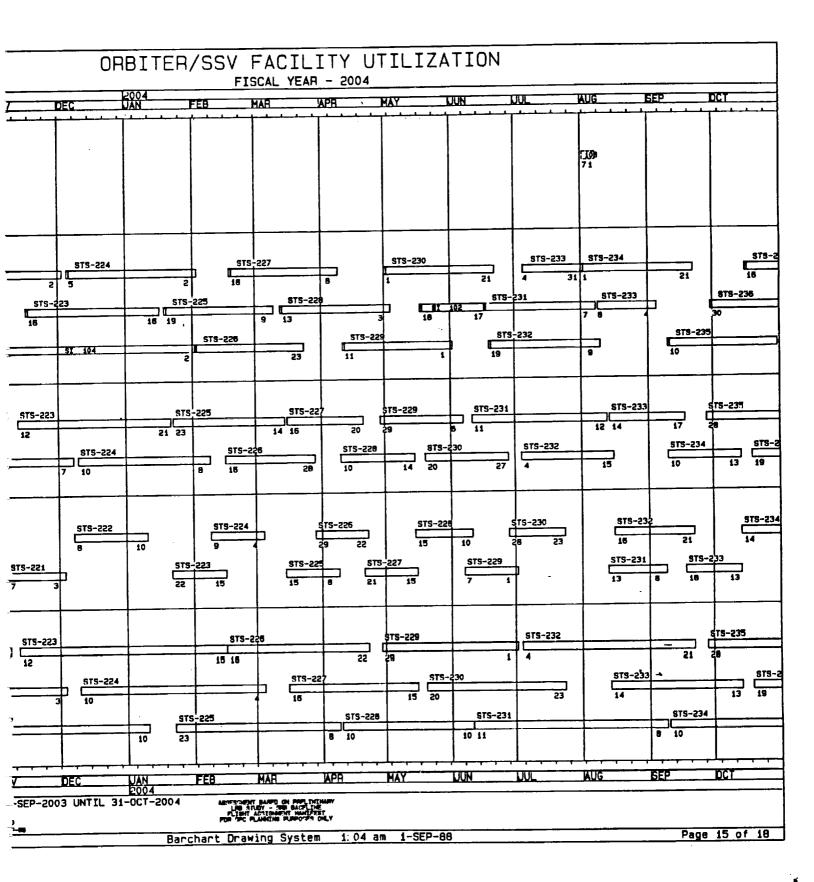
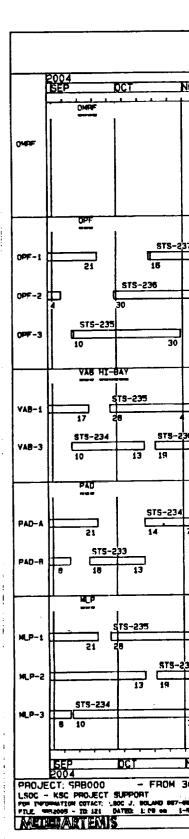


Figure 2.3-15 FY2004 Orbiter/SSV Facility Utilization





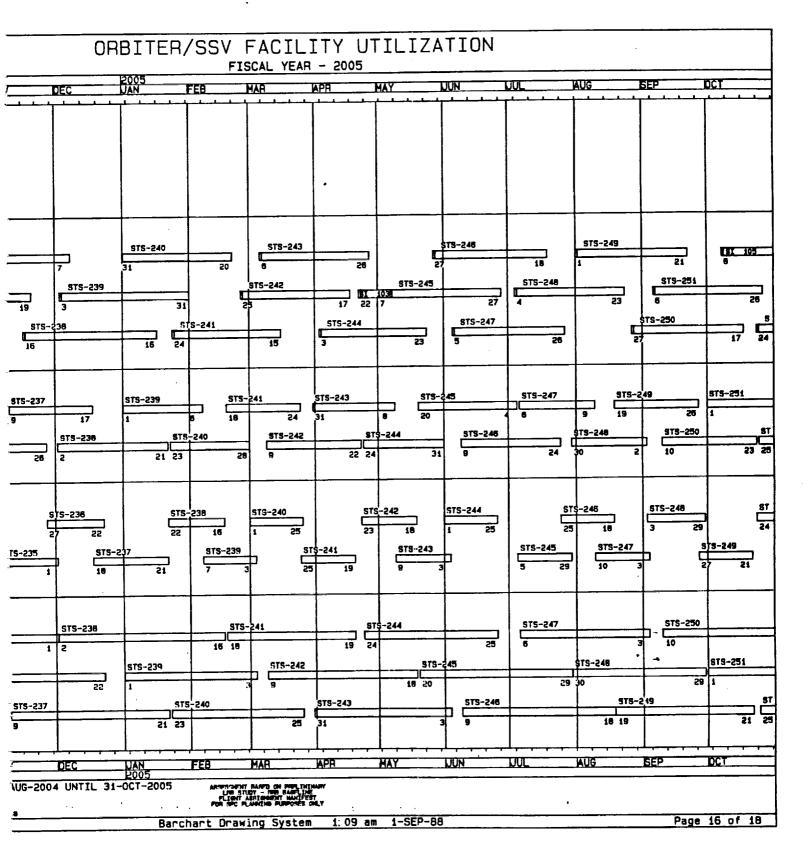
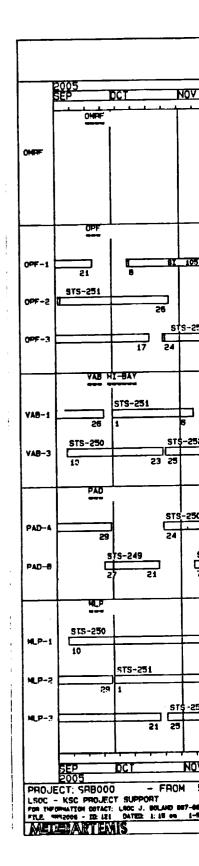
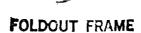


Figure 2.3-16 FY2005 Orbiter/SSV Facility Utilization





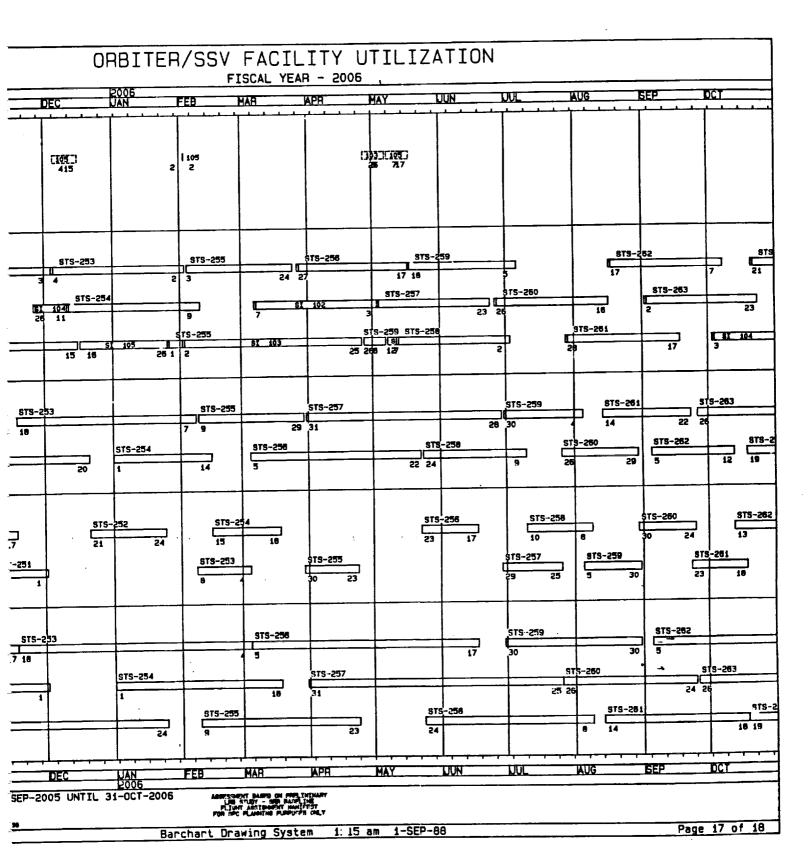
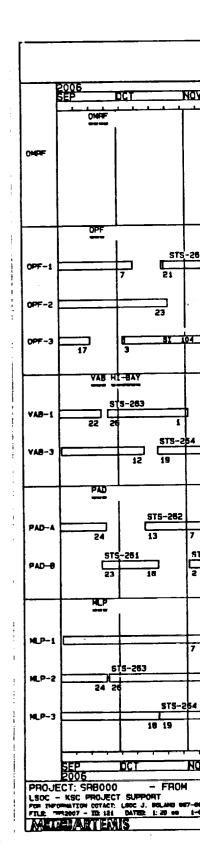


Figure 2.3-17 FY2006 Orbiter/SSV Facility Utilization



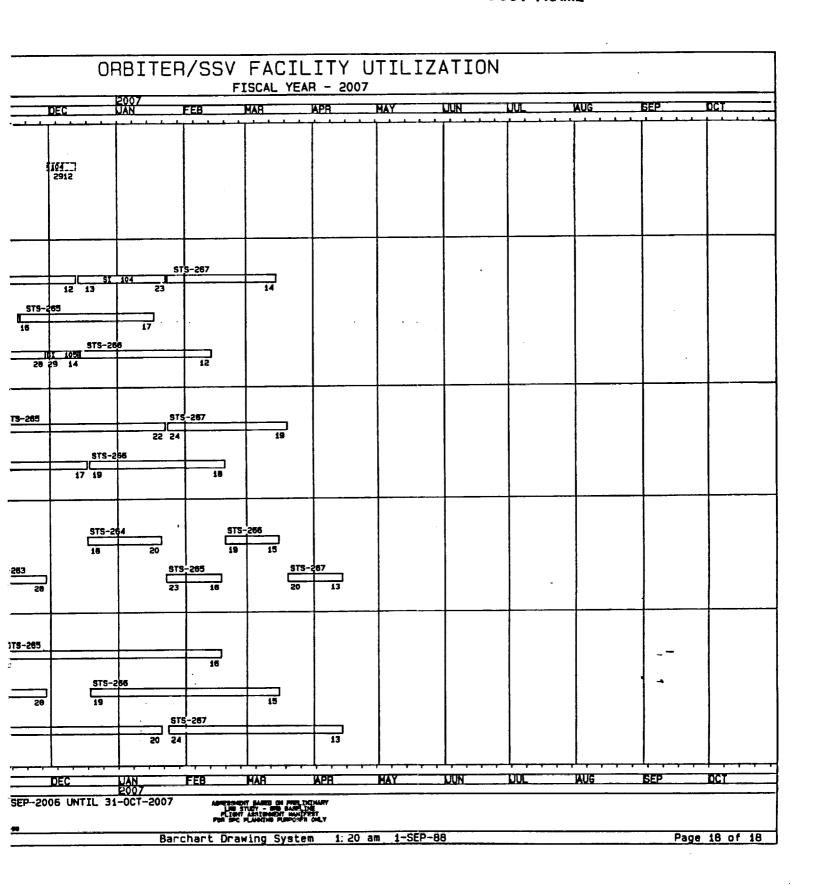


Figure 2.3-18 FY2007 Orbiter/SSV Facility Utilization

VOLUNE V - SECTION 2 APPENDIX

TABLE OF CONTENTS

- 2.1 ET/SRB BASELINE FACILITY UTILIZATION (FY 1992 THRU FY 2007)
- 2.2 ET/SRB FACILITY OPEN PERIODS (FY 1992 THRU 2007)
- 2.3 ORBITER/SSV FACILITY UTILIZATION (FY 1990 THRU FY 2007)

.

VOLUME V

SECTION 3

LRB FACILITY REQUIREMENTS AND CONCEPTS FOR NEW FACILITIES

VOLUME 5 SECTION 3 LIST OF APPENDED SUPPORTING DATA AND FIGURES

3.1 Flame Trench Modification

The appendix section describes the present construction of the flame trench at Pad 34A and B and the geometry with respect to the Crawler Transporter tracks.

3.1.1 Flame Trench Description

The flame trench is 58 feet wide and 40 feet deep. It is lined with 6" refractory concrete brick on a 3 foot thick single pour monolithic steel reinforced walls and base. Figure 3.1.1 shows the detail design. To widen the trench would require removal of the brick and concrete in the area of the booster.

3.1.2 Crawler Transporter Width

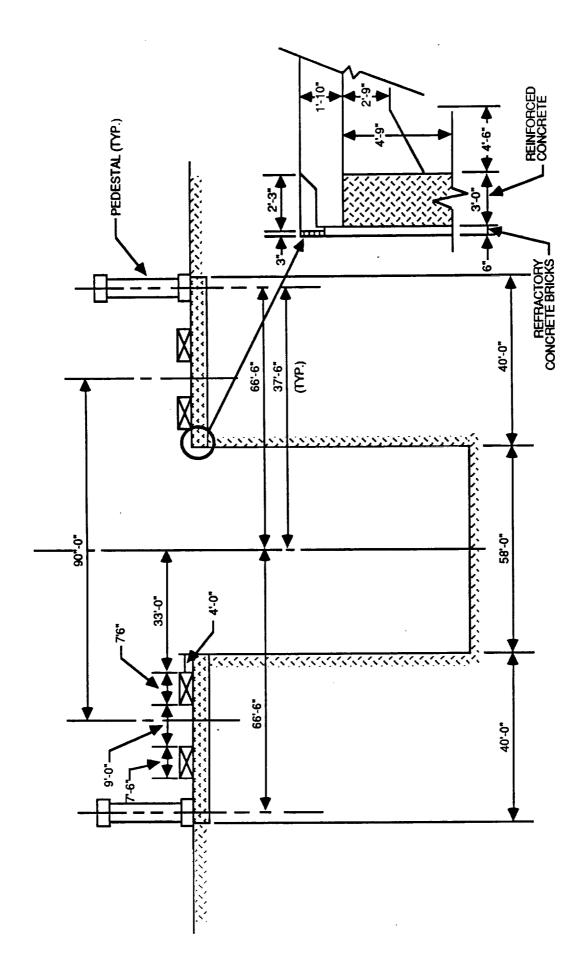
As seen in Figure 3.1.1 the inside width of the crawler transporter is 66 feet. The present clearance of the concrete wall and the transporter track is 6 inches. To maintain a 3 foot thick trench wall would require the wall to be under a crawler transporter track. If the trench wall thickness can be reduced to 6 inches at the top of the trench 5 feet can be gained. However, since the wall is a single pour a clear angled surface for installation of the refractory concrete brick will be time consuming.

3.4.1.3 Conclusion

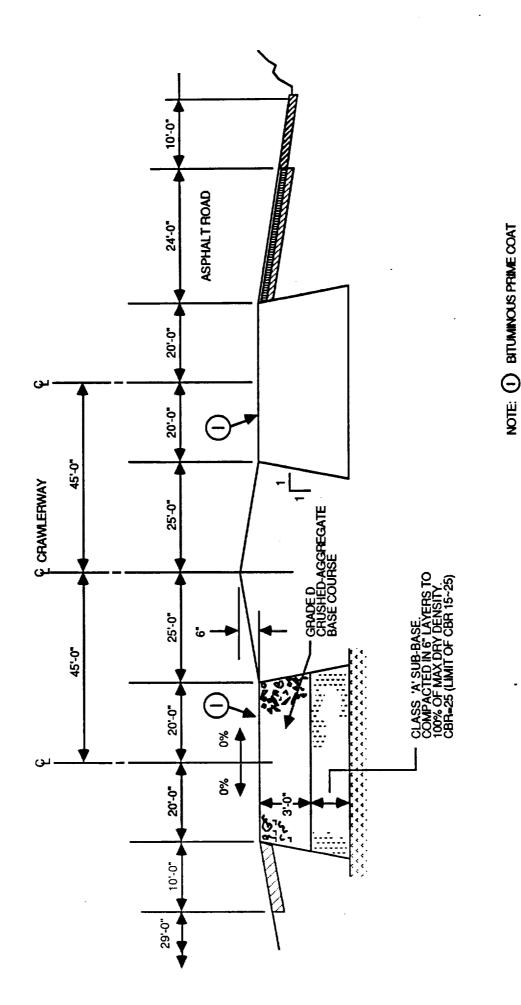
The feasibility of modifying the flame trench is limited by the existing crawler and existing construction. Providing a new crawler with a wider track will impact the MLP pedestal (on the pad and in the VAB) and the crawlerway. Further detailed design analysis is required in a Phase-B study.

3.1.4 Reference

Core of Engineers Drawings 203-102



REF DWG: 203-102 SH 3080



REF. DWG: CORPS OF ENGR DWG# 203-102

VOLUME V

SECTION 4

LRB LAUNCH SUPPORT EQUIPMENT DEFINITION

(All supporting data for this Study Product is included in Volume III.)

VOLUME V

SECTION 6

LRB MANPOWER

VOLUME V SECTION 6 LRB MANPOWER APPENDICES TABLE OF CONTENTS

6.1	Liquid Rocket Booster Integration Study Dr. W. F. Huseonica
6.2	WBS Data On STS Processing
6.3	Morton Thiokol Technician Head Count
6.4	SRB Technician Count By Location
6.5	LRB Skill Mix Counts
6. 6	Manloading By Location Data
6.7	NASA Support Team Headcount Data

VOLUME V SECTION 6

LRB Manpower

- 6.1 LRB Integration Study Dr. W. F. Huseonica
- 6.1.1 This study was developed using data for the year 1985 from the WBS/PWO reporting system. SRB manhours were used as a baseline and were modulated with SRB/LRB technical differences to arrive at LRB estimates. The ratios of support technician for the Orbiter were used rather than the SRB because of the multiple liquid engines and associated control mechanisms. These ratios were further modulated to reflect the differences in complexity between the LRB and the Orbiter.

LIQUID ROCKET BOOSTER INTEGRATION STUDY DR. W.F. HUSEONICA, PAWS, INC.

LRB PROCESSING MANHOURS AND COST

SKILL MIX	RATIO	MANHOURS	LOADED RATE	COST	MHRS % OF TOTAL	COST % OF TOTAL
Technicians	1.00	20,056	\$17.72	\$355,392	11%	11%
Processing VAB Pad		11,744 3,632 4,680		· ·		
Engineering	0.89	17,850	\$20.55	\$366,814	10%	11%
Fac & Gnd Spt	1.14	22,864	\$17.20	\$393,258	13%	12%
Logistics	0.53	10,630	\$16.19	\$172,095	6%	5%
Quality	0.38	7,621	\$18.29	\$139,393	4%	4%
Safety	0.08	1,604	\$18.29	\$ 29,346	1%	1%
PP & C	0.22	4,412	\$17.88	\$ 78,892	2%	2%
Overhead	0.42	8,424	\$19.30	\$162,574	5%	5%
Grumman	0.71	14,240	\$19.75	\$281,235	8%	8%
SUBTOTAL		107,701		\$1,979,000		
Base Supprt EG & G NASA - CS	1.60 1.92	32,090 38,508	\$16.00 \$22.00	\$513,434 \$847,165	18% 22%	15% 25%
TOTALS		178,298		\$3,339,599	100%	100%

- COMMENTS AND ASSUMPTIONS:

 1. MHRS and cost for processing LRBs from receipt thru launch
 2. All skill mixes are ratioed to technicians
 3. MHRS and cost are based on the LRB processing flow
 4. EG&G base support assumes 20% supports cargo and 80% supports shuttle element
- processing
 The NASA/KSC civil service values have the assumptions as the EG&G base support assumptions as the EG&G base support assumption in item #4
 A non-recoverable LRB is assumed in the above table 5.
- Reviewed 6/17/88

- S. Burns
 A. Withers
 K. Humphries
- B. Husednica
- G. Artley

TQUID ROCKET BOOSTER INTEGRATION STUDY DR. W.F. HUSEONICA, PAWS, INC.

LRB PROCESSING MANLOADING

SKILL MIX	RATIO	MANHOURS	MANPOWER
*			
TECHNCIANS	1.00	20, 056	47
ENGINEERING	0.89	17,850	42
FAC & GND SUPPT	1.14	22, 864	54
LOGISTICS	0.5 3	10,630	25
QUALITY	0.38	7,621	18
SAFETY	0.08	1,604	4
PP&C	0.22	4,412	10
OVERHEAD	Ø. 42	8,424	20
GRUMMAN	Ø. 71	14,240	34
		•	
	5	UBTOTAL	254
BASE SUPPT-EG&G	1.60	32,090	76
NASA/KSC-CS	1.92	38, 508	91
	SL	JBTOTAL	- 167
		TOTAL	421

COMMENTS AND ASSUMPTIONS:

- 1. MANPOWER BASED ON A 53 DAY GENERIC LRB FLOW
- 2. MANPOWER IS CALCULATED 8 HRS A DAY TIMES 53 DAYS AND DIVIDED INTO MANHOURS

. /

DR. WFH, PAWS, INC.

CURRENT SRB PROCESSING MHRS AND COST

185 P 85				9500
800	AVE	AVE	UCL UCL	J UCL
SRB ACTIVITY/LOC	MHRS	COST	MHRS	COST
SRB PROCESSING	15, 892	+265, 800	18,603	\$311,191
SRB STACKING	7, 979	\$139,764	10,240	\$181,00B
VAB INTEGRATION	3, 636	\$62,657	5, 095	\$88,728
PAD PROCESSING	15, 943	\$299,000	18, 575	\$343, 842
SRB SHOPS/SE MAINT	2, 885	\$46,350	3,378	\$54,264
SRB OPS SUPPORT	5, 893	\$153, 321	6, 898	\$179,466
INTEG OPS SUPPORT	7,000	\$144,360	7, 961	\$164,167
PSF - MAINT	2, 479	\$47, 914	2,818	\$54,488
VAB - MAINT	4,078	\$79,313	4, 639	\$90,196
PAD/MLP - MAINT	243	\$4,979	276	\$5, 661
SAFETY	4,729	\$100,800	5, 377	\$114,630
OVERHEAD	3,679	\$79,500	4, 183	\$90,407
SPC (LSOC) SUPPORT	•		,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
SRB PROCESSING	721	\$14,817	1,120	\$23,016
SRB STACKING	733	\$15,063	784	\$16,111
VAB INTEGRATION	123	\$2,528	254	\$5, 220
PAD PROCESSING	3,765	\$72,043	5, 704	*109,146
OPS SUPPORT	251	\$4,591	B14	\$14,888
GRUMMAN	2,760	\$54,507	3,997	\$78,936
				7/01 330
SUBTOTAL	82,789	\$1,587,306	100,716	\$1,925,365
BASE SUPPORT - EG&G	32,090	4E17 474	20.000	4515 151
NASA/KSC - CS	38, 508	\$513,434	32,090	\$513, 434
	20, 200	*847, 165	38,508	\$847, 165
SUBTOTAL	70,598	\$1,360,599	70, 598	\$1,360,599
SRB RETREIVAL/DISASS	6, 800	\$138,800	7, 539	\$153, 164
SRB RETREIVAL VESSEL	5, 672		6, 450	\$134,425
HANGAR AF OPB	10,885	\$217,372	12, 379	\$247, 195
USBI - KSC OPS	74, 436	\$1,423,758	88,043	\$1,678,048
SUBTOTAL		\$1,898,137		· ·
GRAND TOTAL	251, 180	\$4,846,042	285, 725	\$5, 498, 796
USBI - MSFC SUPPORT	130, 263	\$2,491,577	154,075	\$2,936,584

 $\mathcal{K}_{\mathbf{r}}$

COMMENTS AND ASSUMPTION:

- MORTON THIOKOL PROCESSING MHRS AND COST AVERAGE BASED ON THE PAST 14 MISSIONS SPC (LSOC) DATA FORET
- THREE (3) MISSIONS
- 3. ALL SPC MHR AND COST DATA IS PWO AND AND WBS DATA
- EG&G AND NASA/KCS CS MHR AND COST DATA ASSUMES 80% OF MHRS & COST SUPPORTS SHUTTLE ELEMENT PROCESSING AND 20% SUPPORTS CARGO OPS AT KSC
- ALL LSOC SUPPORT IS ENGINEERING MRS EXCEPT 1/2 OF PAD PROCESSING AND THE OTHER HALF IS TECHS AND ALL OPS SUPPORT IS QUALITY PEOPLE
- IT IS ASSUMED THE USBI-KSC OPS IS 5. STAFF APPROX IS SAME AS MORTON THIOKOL AT 400 PEOPLE

TABLE 3.1
SHUTTLE PROCESSING ORGANIZATION
STAFFING, RATIOS & LOADED RATES

<u> </u>	ENT FUNCTION	HEAD COUNT	RATIO	LOADED RATES
XX	TECHNICANS	1005 ^{::}	1.00	\$17 . 72
XX-XX	OVERHEAD	423	0.42	\$19.30
	PROGRAM MANAGEMENT HUMAN RESOURCES MISSION MANAGEMENT BUSINESS MANAGEMENT	26 66 68 263	0.02 0.07 0.07 0.26	
17-XX	PROCESSING ENGINEERING	892	0.89	\$20.55
22-XX	PROCESS PLANNING & CONTROL	225	0.22	\$17.88
3X-XX	FACILITY & GROUND SUPPORT	1863	i.85	\$17.20
	GRUMMAN INTEG GND SUPPORT FACILITY O & M COMMUNICATIONS SUPPORT ENGINEERING TEST SUPPORT MGMT ORGANIZATION MGMT	713 648 302 152 36	0.71 0.54 0.30 0.15 0.04	
-xx	LOGISTICS	528	0.53	\$15.19
5X-XX	SR & QA	462	0.46	\$18.29
	R & QA Safety	385 77	0.38 0.08	
MX-XX	MORTON THIOKOL-SRB & ET PROC	387	0.39	\$17.18
	TOTAL SHUTTLE STAFFING	5785		

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SHUTTLE - 4.37 : 1 SHUTTLE II - 1.00 : 1

ELV - 1.60 : 1

- D SHUTTLE SCRUB/RECYCLE PER DAY

 TECHNICANS 5,000 MHRS

 SUPPORT 21,850 MHRS

 TOTAL MHRS 26,850

 TOTAL COST \$483,300 (1986*)
- 0 BCHEDULED TO UNBCHEDULED MAINTENANCE RATIO - 2.42 1 1

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VOLUME V SECTION 6

LRB MANPOWER

6.2 WBS Data On STS Processing

6.2.1 Work breakdown structure data for the year 1985 was chosen as a baseline for use in developing LRB data. This period was used because it represented the highest launch rate and busiest work activity of any year in STS history. Ten launches occured during this era which is the closest approximation to 14 launches per year that could be found.

SRB PROCESSING MANHOURS AND COSTS. WBS 1.1.2.1

MITT ONLL

MISSION	MHRS SRB PROCESS	3 -	LOADED COSTS SRB PROCEBS			
STS-17 STS-19 STS-20 STS-23 STS-24 STS-25 STS-26 STS-27 STS-28 STS-30 STS-31 STS-32 STS-32	1730 1980 1250 1390 920 1410 1670 1600 1950 1230 1070 2870	30 30 30 30 30 30 30 30 30 30 30 30 30 3	\$278786.96 \$345188.06 \$215596.96 \$247488.96 \$169388.96 \$233586.96 \$277588.96 \$254588.98 \$256688.98 \$198288.98 \$177988.98		•	
MHRS COSTS	95% LCL 13182 229409	SAMPLE MEAN 15892 265800		95x UCL 18603 311191	8TD DEV 4986 83499	STD ERR 1383 23159

BRB STACKING OPERATIONS WBS 1.1.2.2

MHRS COSTS	5717 98521	7979 1397 64		10240 181008	4318 78735	1154 21043
8غ. 	95% LCL	BAMPLE MEAN		95% UCL	STD DEV	STD ERR
8TS-33	16500		\$303100.00			
8T8-32	6900		\$124900.00		•	
8T8-31	5900		*106300.00			
STS-30	8200	· •	\$141900.00	•		
8T8-28	5000		\$84000.00			
STS-27	14200		\$255400 . 00	•		
8T8-26	13700	•	\$2342 00.00			
8T8-25	3600	_				•
8T8-24	700		\$14100,0 8			
8T8 - 23	· _ 6800		+1192 00.00			•
8T8-20	5500		\$102900.00		•	
8T8-19	8900		\$154900.00			
8TS-17	9200		\$154800.00			
ST9-14	5500	1	\$113888.00			
MISSION	STACK	_	STACK			
	BRB		SRB			
	MHRS		COSTS			
	,		LDADED			

'ERB RETRIEVAL AND DISABSEMBLE OPERATIONS WBS 1.1.2.3

MHRS COSTS	6061 124436	680 0 138800	•	7539 153164	141 0 27421	377 7328
	95% LCL	SAMPLE MEAN		95% UCL	STD DEV	STD ERR
8T8-32	8100)	\$174500.00			
8TS-31	4800		\$105400.00			
8TB-30	6100		\$133200.00			
8T8-28	6200		\$140200.00			
8T8-27	5300	3	\$196800.00			
8TS - 26	8400	•	\$157200.00			
8T8-25	5300		\$101000.00	I		•
8T8-24	5700		\$115400.00	•		
BT8-23	629		#130400.00	1		
8T8-20	9000	3	\$183200.00	ı	• ,	•
8T8-19	6600	B	\$135100.00	1		•
STS-17	7500		\$151900.00	I		
8T8-14	9100	3	\$173000.00			•
8T8-13	6900		\$124900.00	1		
MISSION	RET/DIS	. R	ET/DI8			
	BRB		erb			
	MHRS		COSTS			•
	•		LOADED			

ET RECEIVING OPERATIONS WBS 1.1.3.1

MISSION	MHRS ET REC	C	DADED OSTS ET REC		·	
STS-14 STS-17 STS-19 STS-20 STS-23 STS-24 STS-25 STS-25 STS-26 STS-27 STS-28 STS-30 STS-31 STS-31 STS-32	500 800 100 400 500 500 400 1200 500 1100 700		\$7700.00 \$8700.00 \$1400.00 \$11000.00 \$11000.00 \$14500.00 \$9900.00 \$14900.00 \$19300.00 \$19300.00 \$18500.00 \$12900.00			
WBS MHRS COSTS	95% LCL 555 10927	SAMPLE MEAN 694 13164		95% UCL 833 15402	STD DEV 284 4567	8TD ERR 71 1142

ET PROCESSING OPERATIONS WBS 1.1.3.2

HBS_	95% LCL	BAMPLE MEAN		95% UCL	STD	STD ERR
6T8-38	5300		#94500.00			
⊸/S−36	6000		#196700.98		•	
*TS-35	5100		\$111600.00	l		
STS-34	4500	•	\$81600.00			
8T6-33	12500)	\$217200.00			
8T8-32	8200)	\$14010 0. 00	l	•	
BT8-31	9600		\$162600.00	1		
8T8-3 9	7100		\$117 600 .00			•
8TB-28	5500		\$91500.00			
STB-27	11700		\$199000.00			
8T8-26	5900)	\$119800.00			
BT8-25	8100		\$149700.00	1	•	•
8T8-24	9600		\$173600.00		÷	
STS-23	9500	-	\$164500 . 00		•	•
8T8-20	7100	=	\$122400.00		• *	
8T8-17	4789		888899.00			
8T8-14 8T8-17	4100 5000		\$73500 . 00 \$86500 . 00			
		_				٠.
MIBBION	PROCESS	P	ROCESS			
	ET	'	ET			
	MHRS		COSTS			

LOADED

INTEGRATED VEHICLE SERVICING - VAB WBS 1.1.4.1

MHRS COSTS	2177 36586	3636 62657	•	5095 88728	2785 4977 9	744 13302
٠	95× LCL	SAMPLE MEAN		95× UCL	BTD DEV	STD ERR
8T8-33	3200		\$61100.00		•	
8TS-32	3700					
STS-31	2400		\$72000.00			
STS-30	2100		\$4550 0. 08		•	
8T9-28	4400		\$76300.00 \$37000.00			
8TS-27	3300		*56900.00	•		
8T8-25	2500		\$48000.00			
8TS-25	5199		\$889 00.00			•
8T8-24	3000		+53200.00	•		_
8T8-23	2000		\$33500.00		•	•
8T8-2 0	2198		+36700.00		• •	
STS-19	2806		+26500.00			
STS-17	1500		\$25900.00			
STS-14	12708		\$221 790.9 9		•	.•
MISSION	BERVICE			•		
	INTEG		NTEB RVICE			
	'MHRB	_	DSTS NTSS			
	•		DADED		•	

SRB/ET PROCESSING SUPPORT WBS DATA

			22VC1 5	95%	STD	STD
	DESCRIPTION	95≭ LCL	BAMPLE MEAN	NCT ADY	DEV	ERR
WBS	DEBCHIPITON				-	
1.1.2.4	BRB SHOP OPS	1057	2371	2776	744	206
	MANHOURS	1967 29618	35797	41796	11201	3197
	COSTS (*)	. 23010	55,5.	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
1.1.2.5	SRB MODB		4.4	17	•	. 1
	MANHOURS	12	14 343	401	198	30
	COSTB (+)	284	343	704		
1.1.2.5	SRB CONTIGENCY		200	443	119	33
	MANHOURS	314	379 7191	8336	2234	620
	COSTS (*)	5907	7121	9330		
1.1.2.7	SRB SE MAINT			440	38	11
	MANHOURS	101	121	142 3721	997	277
	COSTS (*)	2637	3179	3/21	331	
1.1.2.8	SRB MGMT/SUPP				1849	513
	MANHOURS	4888	5893	6898 179466	48097	13339
	COSTS (*)	127177	153321	1/2700	40037	3000
1.3.3	ET SHOP OPS			4500	437	102
	MANHOURS	1256	1456	1655 26832	7078	1652
	COSTS (\$)	20357	, 23594	. 20032	70,0	
1.1.3.4	ET MODS			4444	302	70
	MANHOURS	868	1006	1144 17462	4607	1075
	COSTS (\$)	13249	15356	1/406	7507	
1.1.3.5	ET CONTINGENCY			272	72	17
	MANHOURS	206	23 9	53 0 1	1398	326
	COSTS (*)	4022	4651	2301	1000	
1.1.3.6				60	18	
	MANHOURS	53	61	69 1826	482	112
•	COSTS (\$)	1385	1506	1050	706	•••
1.1.3.7	ET MGMT/SUPP		0047	3203	845	197
	MANHOURS	2430	2817 73339	83401	22 00 2	5134
	COSTS (*)	63277	72027	03701		
1.1.4.6	INTEG CONT OPB	—		7142	1884	440
	MANHOURS	5418	6280 131360	149383	3940B	9195
	COSTS (*)	113337	191904	477000		
1.1.4.B	LAUNCH OPB SUPP	=		040	216	50
	MANHOURS	621	72 8	819 14784	3900	910
	COSTS (*)	11216	13000	14/04	2200	240

FACILITY AND OVERHEAD WAS DATA

PART I		5 5 5	DAME: 5	044	OTT.	OTN
WBS	DESCRIPTION	95x LCL	Bample Mean	95× UCL	DEV .	BTD ERR
PROCESS A	ND STORAGE FACIL	ITY				
1.1.2.9	PSF OPS					
	MANHOURS COSTS (*)	696 14581	8 07 169 00	918 19219	242 · . 5878	5 . 118:
		0 1004				
1.3.28.1	PSF MAINT					
	MANHOURS	_ 99	114	.130	. 34	4
	COSTS (\$)	2 90 3	3364	3826	1809	23(
1.3.28.4	PSF SE MODS		•	:		•
	MANHOURS .	1072	1243	1413	· 373	a:
•	COSTS (\$)	18415	21343	24271	6403	1494
1.3.28.5	PEF OPS SUPP	•				•
	MANHOURS	271	314	357	94	22
	COSTS (\$)	5442	6397	7172	1892	442
VAB						
1.3.4.1	VAB FAC MAINT					
•	MANHOURS	1344	1557	1771	467	109
•	COSTS (*)	24436	28321	32207	8496	1983
1.3.4.3	VAB REBERVED		•			•
	MANHOURS	1781	2064	2348	619	145
	COSTS (*)	34832	40371	45910	12111	2826
1.3.4.5	VAB DP8 SUPP					
	MANHOURS	394	457	520	137	32
	COSTS (\$)	9164	19621	12079	3186	744
MLP	•					
1.3.5.1	MLP MAINT					
	MANHOURS	80	93	106	28	7
	COSTS (*)	1473	1797	1941	512	129
1.3.6.2	MLP MODS			• •		•
	MANHOURS	123	143	162	43	18
	COSTS (*)	2749	3186	3623	956	223
PAD A				•_		
1.3.8.1	PAD A MAINT			•	• .	
	MANHOURS	6	7	B	2	. 1
ĺ	COSTS (*)	74	86	97	25	6

FACILITY AND OVERHEAD WAS DATA PART II

WBS	DESCRIPTION	95% LCL '	BAMPLE MEAN	95% UCL	DEV	STD ERR
HANGAR A	F					
1.3.13.1	HANGAR AF MAINT			· :	••	
	MANHOURS	5565	6450	7335	1935	. 452
	COSTS (*)	108744	126036	143328	37811	, 8 822
1.3.13.2	HANGAR AF MODB	*			•	
	MANHOURS	191	221	252	66	16
	COSTS (*)	4265	4943	5621	1483	346
1.3.13.3	HGR AF REBERVED	.•	·	•	•	•.
	MANHOURS	3636	4214	4792	1264	295
	COSTS (*)	74548	86393	98246	25918	6048
SRB RETRI	EIVAL VESSELS	•		•		
1.3.14.1	VESSEL MAINT			•	•	
•	MANHOURS	1837	2129	2421	639	149
	COSTS (*)	39615	45914	52214	13774	3214
. 3. 14. 3	VESSEL RESERVED					
	MANHOURS	3057	3543	4029	1063	248
	COSTS (\$)	62374	· 72293	82211	21588	5061
SAFETY						
1.6.1.1	SAFETY					
	MANHOURS	4080	4729	5377	1419	331
	COSTS (\$)	86970	100800	114630	30240	7056
OVERHEAD	•					
1.64 1.	7 MGMT SYS	•				
	MANHOURS	3174	3679	4183	1104	258
•	COSTS (\$)	68593	79500	90407	23850	5 565

VEHICLE TEST AND LAUNCH OPERATIONS - PAD WBS 1.1.4.2

MHR8 CDSTS	13311 254158	15943 299000	•	18575 343842	5025 85604	1343 22879
	95% LCL	SAMPLE MEAN		95% UCL	DEV	STD ERR
8T8-33	2020	3	\$372200.00			
8T8-32	8500	-	\$155500.00			
STS-31	1200		\$218300.00			
8T8-20	1310	- ,	\$237300.00			
8T8-28	1650	8	\$282900 . 00			
8TS-27	1960	8	\$343800.00		. •	
8T8-26	1430	0	\$25050 0. 00	1		•
8T8-25	2280	8	. \$416900.00	•	•	•
BT8-24	1926	8	\$360800.00	1	•	
8T8-23	1550	8	\$289700,00	1	• '	•
8T8-2 0	830	0	\$195200.00			
8T8-19	1330	3 .	*334600.00			
STS-17	. 1450	•	\$274600.00			
STS-14	2540	2	\$453700.00	1	•	•
MISSION	PAD		PAD			
MIDDIAN	VEH TBT	'. •	EH TET		•	
	MHRS		COSTS			
	_		LDADED			

LRB MANPOWER

6.3 Morton Thiokol Technical Head Count

6.3.1 In order to develop the LRB/SRB comparisons it was necessary to establish the number of MTI technicians and their support ratios. They are as follows:

Retrieval Techs	24
Disassembly Tech	38
SRB Techs RPSF	48
VAB	34
PAD	18
External Tank	26
(processing)	
Integration	33
TOTAL TECHS	221
Support MTI	318
TOTAL MTI	539

LRB MANPOWER

6.4 SRB Technician Count By Location

6.4.1 In order to establish a direct correlation between the LRB and SRB technician work force, the manhours at each location was devided by the number of days spent in the facility times 8 hours. This data was used for determining the LRB technician head count. A similar exercise was performed for the SRB as well and is included as a part of the database in this appendix.

SRB STAFFING

TECHNICIANS

SRB Processing
SRB Skirts 17 days

Inspection/SEG off load

17 days - (11 day overlap with SRB skirts)

Booster Stacking ET Mate & C/O SYS INT C/O

21 days 11 days 5 days

RPSF 5 days / 3 shifts

15,892 mh = 690 mh/day

= 86 techs

RPSF

23 days

8 hours

7,979 mh = 379.95 mh/day

47 techs

VAB

21 days

8

15,943 mh = 8

= 886.7 mh/day

= 111 techs

PAD

18 days

8

LRB MANPOWER

6.5 LRB Skill Mix Counts

6.5.1 Each of the tasks in the ARTEMIS CPM charts was examined to determine what technician skill was examined to determine what technician skill would be required. Basic skill types of mechanical, electrical, engine and TPS were established. Totals were compiled and the skill mix comparison charts evolved from the data.

LRB MECHANICAL TECHNICIAN MANHOURS

<u>OMI</u>	HOURS	LOCATION	CUMULATIVE HOURS
048C	64	VAB	64
054C	48	VAB	112
050C	64	VAB	176
051C	80	VAB	256
150D	56	VAB	312
055D	336	VAB	648
250E	16	VAB	664
066D	16	VAB	680
056D	48	VAB	728
067D	32	VAB	760
155E	336	VAB	1096
059D	128	VAB	1224
164E	16	VAB	1240
166E	16	VAB	1256
156E	48	VAB	1304
167E	32	VAB	1336
159E	128	VAB	1464
061F	1056	VAB	2520
069F	48	VAB	2568
073F	256	VAB	2824
078F	80	VAB	2904
01A	84	HPF	2988
06A	64	HPF	3025
02A	80	HPF	3132
05A	72	HPF	3204
A 80	64	HPF	3268
012B	112	HPF	3380
013B	32	HPF	3412
015B	32	HPF	3444
016B	32	HPF	3476
044B	640	HPF	4116
046B	288	HPF	4404
023B	256	HPF	4660
022B	144	HPF	4804
040B	320	HPF	512 4
021B	96	HPF	5220 5604
034B	384	HPF	5748
035B	144	HPF HPF	5812
032B	64 128	HPF	5940
033B 031B	192	HPF	6132
031B	1536	HPF	7668
036B	288	HPF	7956
030B	576	HPF	8532
301B	80	HPF	8612
047B	160	HPF	8772
053B	80	HPF	8852
070G	64	PAD	8916
071G	64	PAD	8980
071G	1344	PAD	10324
072G	160	PAD	10484
074G	192	PAD	10676
	-		
		SUB!	TOTAL 10676 .

LRB MECHANICAL TECHNICIAN MANHOURS (CONTINUED)

<u>OMI</u>	HOURS	LOCATION	CUMULATIVE HOURS
			10676
080T	80	PAD	10756
075G	288	PAD	11044
076G	64	PAD	11108
084H	132	PAD	11240
083H	16	PAD	11256
082H	16	PAD	11272
085H	168	PAD	11440
086H	144	PAD	11584
090н	192	PAD	11776
089H	32	PAD	11808
091H	48	PAD	11856
094H	96	PAD	11952
095н	240	PAD	12192
096н	32	PAD	12224
097H	48	PAD	12272
0981	360	PAD	12632
104H	96	PAD	12728
101H	96	PAD	12824
099н	160	PAD	12984
106H	192	PAD	13176
111H	96	PAD	13272
108H	32	PAD	13304
107H	32	PAD	13336
109H	128	PAD	13464
1901	640	PAD	14104
		TOTAL CUMULATIVE HOU	JRS 14104

LRB ELECTRICAL TECHNICIAN MANHOURS

<u>OMI</u>	HOURS	LOCATION	CUMULATIVE HOURS
01 A	84	HPF	84
07A	64	HPF	148
04A	64	HPF	212
019B	64	HPF	. 276
014B	32	HPF	308
017B	64	HPF	372
018B	64	HPF	436
020B	192	HPF	628
046B	288	HPF	916
024B	192	HPF	1108
024B	288	HPF	1396
020B	64	HPF	1460
027B	320	HPF	1780
029B	128	HPF	1908
030B 025B	384	HPF	2292
		HPF	2356
115B	64 25 <i>6</i>	HPF	2612
042B	256 204		
043B	384	HPF	2996 315 <i>6</i>
114B	160	HPF	3156
047B	160	HPF	3316
053B	80	HPF	3396
151C	80	VAB	3476
049C	64	VAB	3540
057D	64	VAB	3604
065D	16	VAB	3620
058D	32	VAB	3652
064D	16	VAB	3668
060D	64	VAB	3732
157E	64	VAB	3796
165E	16	VAB	3812
158E	32	VAB	3844
160E	64	VAB	3908
061F	1056	VAB	4964
062F	48	VAB	5012
063F	96	VAB	5108
077F	640	VAB	5748
078F	80	VAB	5828
080T	80	PAD	5908
081H	48	PAD	5956
088H	48	PAD	6004
093н	32	PAD	6036
087H	192	PAD	6228
092H	96	PAD	6324
0981	360	PAD	6684
103H	64	PAD	6748
105H	48	PAD	6796
100H	288	PAD	7084
110H	32	PAD	7116
112H	96	PAD	7212
1901	640	PAD	7852

TOTAL CUMULATIVE HOURS 7852

LRB ENGINE TECHNICIAN MANHOURS

<u>OMI</u>	HOURS		LOCATION	CU	MULATIVE HOURS
039B	192		HPF		192
041B	224		HPF		416
047B	160		HPF		576
300B	16		HPF		592
102H	256		PAD		848
360H	384		PAD		1232
1901	640		PAD		1872
		TOTAL	CUMULATIVE	HOURS	1872

LRB
TPS TECHNICIAN MANHOURS

<u>OMI</u>	<u>HOURS</u>	LOCATION	CUMULATIVE HOURS
045B	1280	HPF	1280
350H	1152	HPF	2432
		TOTAL CUMULATIVE	HOURS 2432

LRB SKILL MIX BY PERCENTAGE

SKILL		TOTAL HOURS	PERCENTAGE
MECHANICAL		14104	53.7%
ELECTRICAL		7852	29.9%
ENGINE TECH		1872	7.1%
TPS TECH		2432	9.3%
	TOTAL	26260	100.0%

LRB MANPOWER

- 6.6 Manpower Loading By Location Data
- 6.6.1 These data were determined by examining each of the tasks in the ARTEMIS base-line CPM chart and allocating them by location. This allowed the establishment of manpower allocation by location. The numbers of the OMI/tasks are used for identification.

VAB MH LRB

OMI	SHIRTS :	HOURS	TECHS	TYPE	TASK HOURS	TOTALS
048C	4	32	2	M	64	64
054C	3 5	24	6	M	48	112
151C	5	40		E	80	192
050C	4	32	2	M	64	256
049C	4	32	2 2 2 2	E	64	320
051C	5	40		M	80	400
150D	1 3 1 2 1	8	7	M	56	456
055D	3	24	14	· M	336	792
250E	1	8	2	M	16	808
057D	2	16	4	E	64	872
065D	1	8	2	E	16	888
058D	2	16	2	E	32	920
064D	· 1	8	2	E	16	936
066D	1	8	2	M	16	952
056D	1	8	6	M	48	1000
067D	2 3 2	16	2	M	32	1032
155E	3	24	14	M	336	1368
060D		16	4	E	64	1432
059D	4	32	4	M	128	1560
157E	2	16	4	E	64	1624
165E	1	8	2	E	16	1640
158E	2	16	2	E	32	1672
164E	1	8	2 2 2 2 6	M	16	1688
166E	1	8 ·	2	M	16	1704
156E	1	8	6	M	48	1752
167E	2	16	2	M	32	1784
160E	2	16	4	E	64	1848
159E	4	32	4	M	128	1976
061F	33	264	8	M/E	2112	4088
069F	3	24	2	M	48	4136
062F	1	8	6	E	48	4184
063F	3	24	4	E	96	4280
073F	3	24	14	M	256	4536
077F	4	32	20	E	640	5176
078F	1	8	20	M/E	160	5336

MANHOURS LRB PAD

OMI	<u>SHIFTS</u>	HOURS	TECHS	TYPE	TASK HOURS	TOTAL
070G	2	16	4	М	64	64
071G	2	16	4	M	64	128
072G	7	84	16	M	1344	1472
079T	1	8	20	M	160	1632
074G	12	96	2	M	192	1824
080T	1	8	20	M/E	160	1632
075G	18	144	2	M	288	2272
081H	1	8	6	. E	48	2320
076G	1	8	8	M	64	2384
084H	4	32	4	M	. 132	2516
350H	18	144	8	TPS	1152	3668
083H	1	8	2	M	16	3684
082H	1	8	2	M	16	3700
085H	7	56	8 2 2 3 6	M	168	3868
088н	1	8	6	E	48	3916
086H	3	24	6	M	144	4060
090н	4	32	6	M	192	4252
089н	1	-8	4	M	32	4284
093н	1	8	4	E	32	4316
087н	6	48	4	E	192	4508
091H	1 3 2	8	6	M	48	4556
094H	3	24	4	M	96	4652
092н	2	16	6	E	96	4784
095H	5	40	6	M	240	4988
096н	1	8	4	M	32	5020
097H	1	_ 8	6	M	48	5068
0981	3	24	30	M&E	720	5788
102H	4	32	8	R	256	6044
104H	3	24	4	M	96	6140
101H	4	32	3	M	96	6236
099н	5	40	4	M	160	6396
103H	2	16	4	E	64	6460
105H	3	24	2 6	E	48	6508
106H	4 6	32	6	M	192	6700
100н 360н	-	48	6	E	288	6988
300H 111H	9	48	8	R	384	7372
108H	3	24	4	M	96	7468
100H 107H	6 3 2 1	16	2 4	M	32	7500
107H 110H	2 1	1 8	4	M	32	7532
100H	2 2 3	16 16	2 8	E	32	7564
112H	<u>د</u> ع	24	Ö A	M	128	7692
1901		24 64	4	E	96	7788
~~~	U	04	30	MER	1920	9708

### MANHOURS

# HPF FOR LRB

01A	3	shifts	(24	hrs	X	7	persons)	M/E	168	6162
06A	4	shifts	(32	hrs	X	2	persons)	M	64	6226
07A	4	shifts	(32	hrs	X	2	persons)	E	64	6290
02A	5	shifts	(40	hrs	X	2	persons)	M	80	6370
05A	3	shifts	(24	hrs	X	3	persons)	M	72	6442
04A	4	shifts	(32	hrs	X	2	persons)	E	64	6506
<b>A</b> 80	4	shifts	(32	hrs	X	2	persons)	M	64	6570
012B	2	shifts	(16	hrs	X	7	persons)	M	112	6682
019B	2	shifts	(16	hrs	X	4	persons)	E	64	6746
014B	1	shift	(8	hrs	X	4	persons)	E.	32	6778
017B	2	shifts	(16	hrs	X	4	persons)	E	64	6842
013B	' 1	shift	(8	hrs	X	4	persons)	M	32	6874
.018B	2	shifts	(16	hrs	X	4	persons)	E	64	6938
015B	1	shift	(8	hrs	X	4	persons)	M	32	6970
016B	1	shift	(8	hrs	X	4	persons)	M	32	7002
020B	2	shifts	(16	hrs	X	12	persons)	E	192	7194
044B	10	shifts	(80	hrs	X	8	persons)	M	640	7834
045B	10	shifts	(80	hrs	X	16	persons)	T	1280	9114
046B	6	shifts	(48	hrs	X	12	persons)	M/E	576	9690
023B	4	shifts	(32	hrs	X	8	persons)	M	256	9946
022B	3	shifts	(24	hrs	X	6	persons)	M	144	10090
024B	3	shifts	(24	hrs	X	8	persons)	E	192	10282
026B	3	shifts	(24	hrs	X	12	persons)	E	288	10570
040B	4	shifts		hrs	X	10	persons)	M	320	10890
027B	2	shifts	(16	hrs	X	4	persons)		64	10954
021B	2	shifts	(16	hrs	X	6	persons)	M	96	11050
034B	4	shifts	(32	hrs	X	12	persons)	M	384	5994
035B	3	shifts	(24	hrs	X	6	persons)	M	144	5610
032B	1	shifts	(8	hrs	X	8	persons)	M	64	5466
033B	2	shifts	(16	hrs	X	8	persons)	M	128	5402
029B	5	shifts	(40	hrs	X	8	persons)	E	320	5274
030B	2	shifts	(16	hrs	X	8	persons)	E	128	4954
025B	· 4	shifts	(32	hrs	X	12	persons)	E	384	4826
031B	3	shifts	(24	hrs	X	8	persons)	M	192	4442
038B	12	shifts	(96	hrs	X	16	persons)	M	1536	4250
039B	4	shifts	(32	hrs	X	6	persons)	R	192	2714
036B	3	shifts	(24	hrs	X	12	persons)	M	288	2522
037B	6	shifts	(48	hrs	X		persons)	M	576	2234
115B	2	shifts	(16	hrs	X	4	persons)	E	64	1658
041B	2	shifts					persons)	R	224	1594
042B	2	shifts		hrs			persons)	Ē	256	1370
043B	3	shifts					persons)	E	384	1114
114B	2	shifts		hrs	X	10	persons)	E	160	730
301B	2	shifts		hrs	X.	5		M	80	720
047B	2	shifts		hrs			persons)	M/E/R	480	640
053B	1	shift		hrs			persons)	M/E	160	
300B	1	shift	( 8	hrs	Х		persons)	R	16	

#### 6.7 NASA SUPPORT TEAM HEAD COUNT DATA

# 6.7.1 NASA Operations Interface Team

# NASA Operations and O&M contractors operational support to all areas of activation functions:

20	TE &/or	SPC	Ops Engineering types
60	TV &/or	SPC	Yount/Lamberth types
20	TL &/or	SPC	Webb types
20	TP &/or	SPC	Carpenter types
10	SI &/or	SPC	Bobic types

# 140 Total personnel

# 5 Person required for an LRB project office

145 total team count

#### NOTE:

Ops and System Engineering OMD's

Ops and System Engineering Software

Ops and System Engineering Certification

Ops and System Engineering ORI

Ops and System Engineering Pathfinder

Ops and System Engineering ORD Turnover/Acceptance

Ops and System Engineering Training]

Ops and System Engineering Certification

^{*} Finance and contracts not included in any team

# 6.7.1.1 Schedule of Manpower Utilization (by %)

| 11990| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 2000 | 25%|100%|100%|100%|100%| 80%| 40%| 30%| 30%| 10%|

Work control, scheduling, outrages/permits, security -- covered in activation support

# 6.7.2 NASA Engineering Interface Team

NASA &/or Contractor To Support Activation Management Team

### A. DE/TM-TV-TE Engineering &/or Contractors

- 4 X 5 TV = 20 Provide Engineering direction/documents from
- 2 X 5 TE = 10 Level II & III
- 1 X 10 DE = 10 Provide change and approval loop
- 1 X 5 RTQ = 5 Provide Site (field Engineers)
- 1 X 5 RTQ = 5 Review & Approval Interium OMIs & TPS Loop
- 1 X 5 SI = 10 Walk downs, test surveillance system acceptance.

# B. TM Operations &/or Contractor

- $5 \times 1 = Site$
- All above and schedule
- $4 \times 5 = Site$
- Plus work control
- Functional Interface
- Schedule approvals
- $2 \times 5 \text{ TE} = 10$
- Site control for staging
- $1 \times 2 \text{ TP} = 2$
- Outage loop
- $3 \times 5 \text{ TL} = 15$
- Permit loop
- 1 X 4 TL = 4
- Security loop
- $2 \times 5 RT/RQ = 10$
- Security 100b

- Area control

- 1 X 5 RS = 5
  - 15 SI = <u>15</u>
    - 51 <del>-</del>.

## C. NASA and KSC Project Planning Office

1 LRB/EB

- Change Control

1 Engineering/GSE

- ICD Approvals

1 Ground Systems

Test data and approvals from/to

1 Finance

Level II & I \$

1 Scheduling

Schedule level III

# D. RQ/Safety and Contractors Environmental

30 people

Impact Assessment

#### Schedule

### 6.7.3 Activation Management Team

Responsible for coordination of design construction and activation of facilities. Interface between the LRB activation and the operational SRB program. Migrate to LRB team as core group for operational phase.

#### Manning Schedule

1991   92	93	94	<u> 95</u>	1 96	1 97	1 98	<u> 1 99</u>	1 2000
130 - 151	268	368	1 298	1 78	105	127	65	62

# **VOLUME V**

SECTION 7

**COST ESTIMATES INCLUDING TRANSITION** 

# VOLUME V APPENDIX 7 COST ESTIMATES

# TABLE OF CONTENTS

ET/LRB Horizontal Processing Facility (Section A)
VAB (Section B)
LRB Mobile Launch Platform #4 (Section C)
LRB Mobile Launch Platform #5 (Section D)
MLP Parksite #2 (Section E)
LC-39 PAD A or B (Section F)
LCC/LPS (Section G)
Launch Equipment Test Facility (Section H)
High Voltage Power Distribution (Section I)

#### **VOLUME V APPENDIX 7**

#### **COST ESTIMATES**

This appendix contains the detailed engineering estimates for the launch site non-recurring costs for each station set impacted by LRB STS integration.

It is the intent of this section to display the derivation of costs for the bottoms-up pricing approach. In general, detailed estimates have been prepared for the facility requirements, Launch Support Equipment (LSE) and Ground Support Equipment (GSE) for each station set. The derivation of station set costs associated with design, TTV, initial spares and activation management is consistent with the cost estimating approach described in Volume III, Sections 7.1.3, 7.1.4, 7.1.5 and 7.1.6 respectively. LRB MLP #4 and #5 are the only station set detailed estimates which display this technique for all cost elements.

The station set non-recurring cost estimates have been summarized and presented in matrix format, for each LRB configuration, in Volume III, Section 7 of this report.

	ROUND SUPPORT	KSC PRELIMINARY COS	T ESTIMATE WO	ORK SHEET	<b>!</b>	CONSTRUCTION
7. NO.	PCN	to a type HA type	DATE PREPAR		SHEE	T /A OF /2A
PROJECT			1 / / -			
LRB	INTEGRATI	ON STUDY				
LOCATION	LAB HPF -	FACILITY				CODE
ARCHITE	T/ENGINEER		ESTIMATOR 3	URNS		
DRAWING				A.	PROVED BY	
ITEM NO.	DESCR	IPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
1.	SITE PREPA	RATION	237,800	37	500	1,189,000
2.	STRUCTURE				25 00	5,945,000
3.	ARCHITECTU	RAL	•		1000	2,378,000
4.	MECHANICA	<u></u>			2500	5,945,000
5.	ELECTRICAL			-	1500	3,567,000
6,	2-30 TON	CRANE				1,600,000
7.	20 TON CRA	•				650,000
8.	2-5 TOH	401374				60,000
9.	12" REINFOR	CED CONCRE	78			
	APRON (165.	000 SF)	20,200	54	3200	647,000
10.	12" REINEOR	CED COULRE	ETE			
	TOWWAY (6	0,000 38)	7300	54	32 00	234,000
11.	OUTFITTING	(20% OF				
	BUILDING C	OST &				
	\$ 19.024.000					3,805,000
						26,020,000
	SUB OVERHE	1D	15	%		3 903 000
	SUB PROFIT	,,	10	%	-	2,993,000
	PRIME MAR	K-UP	10	%		3,291,000
	BOUD			%		362,000
	ESCALATION	(Z YEARL)	10.25			3,748,000
	CONTINGEN	4	15	1/2		6,048,000
	TETAL	FASILITH				45,355,000
				ORIC	INAL PAGI	: Is
			1	1	OOR QUAL	have

	GROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE W	ORK SHEE	iT .	☐ CONSTRUCTION
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PROJECT		10-10.	-88		
LE	B INTEGRATION STU	DY			
LOCATIO	"ET AND LRB GROUND SU SE), LC-39, KSC	PPORT	EQU	PMENI	CODE
ARCHITE	CT/ENGINEER	ESTIMATOR			
DRAWING	NO.	K. H		955UN	
	Service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the service of the servic			PPROVED BY	
PASE ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	
	SUMMARY - GSE:	GOARTITI	UNIT	& LABOR	ESTIMATED AMOUNT
34	ACLESS EQUIPMENT			·   · · · · ·	\$1,029,600
3 A	ECS EQUIPMENT	:			153.000
34	BATTERY SHOP				300,000
44	TVC SYSTEM				580,000
44	PNEUMATIC SYSTEM			·	1,470,000
54	POWER EQUIPMENT				682,000
5A_	PYRO EQUIPMENT				432000
6_	INSTRUMENTATION THERMAL PROTECTION SYSTEM				420,000
64	THERMAL PROTECTION				80 000
				•	\$5,146,600
	SUB OVERHEAD	15	%		717,990
	SUB PROFIT	10	%		591, 859
	PRIME MARKUP	10	0/0		651,045
	BOND	/	%		71,615
	ESCALATION (ZYR.)	10.25	%		741, 394
	CONTINGENCY	15	0/0		1,196,175
					9,119618.
	TOTAL GSE			8012	9. 200.000.
	1012 0,32		•	D17 9	7, 200, 500,
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	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO	RK SHEET		CONSTRUCTION
3. NO.	PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN - PCN -	DATE PREPARI	•• _ •	SHEET	34 of 124
PROJECT	OB INTEGRATION STU	DY.		<i>246.</i> 45	- CODE
LOCATIO	"ET AND L'RB GROUND SI E), LC-39, KSC	LPPOET	- EQU	PMENT	
	CT/ENGINEER	ESTIMATOR	WASS	UM	
DRAWING	CHECKED BY	August State		PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	TINU	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	ACCESS EQUIPHENT:				
1,	ELEVATOR WORK PLATFORMS	5			
	ET	4	EA	120,000	1480,000
2.	ELEVATOR WORK PLATFORM	5			
	LRB	4	EA	85,00	340,000
3.	INTERTANK ACCESS DOOR				,
	PROTECTOR	2	EA	2,800	5,600
H	INTERTANK ACCESS TOOL				
, <u></u>	KIT	2	EA	5,000	10,000
1 5	TOW TRACTOR	2	EA	65000	
6,		16	EA	4000	64.000
- 37	SUBTOTAL				1,029,600
	ECS EQUIPMENT:				
7	ECS FLEX, DUCT SET	7	EA	2000	4,000
	ECSFLEX DUCT ADAPTER				
	SET	2	EA	9500	19,000
9	CIRCULATING MODULE	2		25,000	50,000
	GROUND COOL LOOP				
7.07	SELECT PANEL	2	EA	40,000	80,000
	SUBTOTAL				153,000
		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1			
	BATTERY SHOP (FLIGHT	1			
	BATTERIES):				
11	CHARSING PANEL	1	ER	75.00	150000
12.	BATTERY TEST PANEL	2	JE A	15000	130 333
13.	BATTERY TOOL SETS	2	FA	10.0000	GE 15 2000
· ·	SUBTOTAL		Ç	F PUOR QU	ALITY 300,000
				1	

	GROUND SUPPORT KSC PRELIM	INARY COST	ESTIMATE WO	RK SHEET	r	CONSTRUCTION
\. NO.	PCN		DATE PREPARE		SHEET	<u>4A</u> of <u>12A</u>
PROJECT	B TNTEGDATION .	STUD	<b>/</b>			
LOCATIO	"ET AND LEB GROW. SE), LC-39, KSC	ND SU		EQU	INPMEN	Acops.
ARCHITE	CT/ENGINEER		R.H.			
DRAWING	CHECK			All All	PROVED BY	
ITEM NO.	DESCRIPTION		ESTIMATED QUANTITY	UNIT	MATERIAL & LABOR	ESTIMATED AMOUNT
	TVC SYSTEM:					A
14,	ELECTRICAL POWER	PANEL	4	EA	60000	240,000
15.	TVC TEST PANEL		4	EA	85,000	340,000
	SUBTOTAL					580,000
	PNEUMATIC SYSTE	M				
	EQUIPMENT:					
lla	LRB AFT COMPART	MENT				
<u> </u>	PURGE PANEL		7	EA	85000	170,000
17	PNEUMATIC PRESSURI	= ////	2	EA	60,000	120,000
18	PNEUMATIC REGULA					
	PANEL		7	EA	85000	170.000
19	PRIMARY HE REDU	CTION			1 1	
	AND BOTTLE FILL		2	EA	1000	20,000
	LRB VENT VALVE AS		•		1 25 10	
	·	_/ ~// / / / /	2	EA.	25000	170,000
· 01	LAB VENT ACTU	7-1-1			1 29 200	
<u> </u>			<b>・・・・</b> ラ	EA	90000	180000
22	CH THERE PAN			271	10,000	, , ,
	GHZ INTERTANK A	MRGE	2	EA	80,00	160000
22	PANEL			-71	09.00	, , , , , ,
<u> </u>	LOX TANK PRESSU		/2	E 1	60,00	2112
011	AND GN2 PURGE		7	EA	100,000	240,000
_24	RPI TANK PRESSO		4	Ex	60, 200	5.23
	AND GNZ PURGE	THNEL	<u> </u>	- /	1	1, 470 000
	SUETOTAL					1; +15; 555
			<del>.</del>		ORIGINAL	PAGE IS
					OF POOR	DUALITY
					01	

	GROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO	RK SHE	ET	CONSTRUCTION
1. NO.		DATE PREPARE		SHEET	5A of 12A
PROJECT	B INTEGRATION ST	LOY			
LOCATIO	" ET AND LRB GROUND SUP		Qui	pre NT	CODE
ARCHITE	E) LC-39 K5C	ESTIMATOR C, H,	1110	001114	
DRAWING		L, M,	<i>WH</i> -	APPROVED BY	
ITEM NO.		ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	POWER EQUIPMENT:				
25.	DC POWER SUPPLY ET	<u>.</u>			
	ELRB	2	ËΑ	200,000	400,000
26.	ELECTRICAL BONDING				
	TEST UNIT	2	EA	2000	4,000
27	DC POWER CABLE SET				
	(GEA-43ETS)	24	EA	1 1,000	24,000
28.	DC POWER PACK	4	EA		240,000
-9.	BUS MONITOR UNIT	2	EA	3,000	6,000
30.	HEATER CONFIDENCE			·	
	TEST SET	2	EA	4,000	
<u></u>					682,000
<u> </u>	PYRO EQUIPMENT:				
31.	PYRO SUBSTITUTION		- 4	10000	70.44
	KNIT	6	EA	12,000	72,000
32,	STRAY VOLTAGE CHECK-		ر د در	10 0 0 0 0	unin
70	OUT UNIT	2	EA		40,00
<u> 33.</u>		<del>//</del>	EA	30,000	60,000
24.	LOW ENERGY PYRO	2	EA	30,000	60,000
35.	SIMULATOR PYRO SYSTEM	2	- 7	13300	
200	CHECKOUT ILNIT	2	EA	30.00	410 30
÷ .;	<u> </u>	- 4	= A	4000	
····	SUBTOTAL				432.2
	•				

	GROUND SUPPORT KSC PRELIMINA	RY COST	ESTIMATE WO	RK SHEE	Ţ	CONSTRUCTION
. NO.			10-10-		SHEET	6A OF 12A
PROJECT	B INTEGRATION STU	IDY				
LOCATIO	NET &LRB GROUND SO SE) LC-39 KSC	IPPOR	T E QU.	IPHE	NT	CODE
ARCHITE	CT/ENGINEER		ESTIMATOR	UAS.	SUM	
DRAWING	NO. CHECKED I	IY,			PPROVED BY	
ITEM NO.	DESCRIPTION		ESTMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	INSTRUMENTATION					
	EQUIPMENT:	-, .' ,				#
.37.	DRIVER AMPLIFIER MO	DULES	4	EA	15,000	160,000
38.	SAFING PANEL SIG	VAL_			-	
	PONDITIONER	· · · · · ·	2	EA	25,000	170,000
39.	COAX CABLE ADAPTA					
	INTERFACE ASSEMB	14	2	EA	10,000	20,000
10.	INSTRUMENTATION					17000
	SENSOR TEST SET		2	EA	85,000	
· ,	SUBTOTAL				<del>                                     </del>	420,000
						·
	THERMAL PROTEC	TION			<u> </u>	· · · · · · · · · · · · · · · · · · ·
41	SYSTEM:	001	7	EA	35000	70000
//-	200-10-0		2	EA	5,000	
42.	SMALL WELDER 1	DOA		En	7,000	80,000
	SUBTOTAL					80,000
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	ROUND SUPPORT QUIPMENT	KSC PRELIMINARY CO	OST ESTIMATE WO	ORK SHEE	T	CONSTRUCTION
0. NO.		CN	DATE PREPAR		SHEE	T 7A OF 12.4
PROJECT	B INTEGR	PATION STUL				
LOCATIO	LRBAFT	PROCESSI		14/7	- <b>/</b>	CODE
LON ARCHITE	TROL ROC	OM	ESTIMATOR L. H. U	14051	111	
BRAWING	NO.	CHECKED BY	(C. 7) - C		PPROVED BY	
TEM NO.	DI	ESCRIPTION	ESTIMATED QUANTITY	TINU	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	FROM SHE	ET BA				\$3,771,000
	SUB OVE	EHEAD	15	0/0		565,650
	SUB PRO	FIT	10			433,663
	PRIME MI	ARKILP	10	%	ļ	477,032
	BOND			%		52,47
·		ON (14R.)	5	%	<u> </u>	26499.
	CONTINGE	ENCY	15		<u> </u>	834,72
·	· · · · · · · · · · · · · · · · · · ·					
	•					6,399,533
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		YTROL BOOKS			SAY	6,400,000
	GSE					
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e	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO	RK SHEET	(	CONSTRUCTION
. NO.	PCH	DATE PREPARE		SHEET	8A of 12A
PROJECT	على المشاكل و الفراد وحسد فالمنا سرا عبد كه فراد المراجعة	)Y			
LOCATIO	IPAGET PROPESSING F		TY CO	NTROL	CODE
ARCHITE	HILE 39 KSC	ESTIMATOR	ulac	-,,,,	
DRAWING	NO. CHECKED BY	<u> </u>		PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
1.	LAUNCH PROCESSING SYSTEM				£
	COMPUTER CONSOLES/CPU	6	EA	400,000	2,400,000
2.	NAROWARE INTERFACE	•			, ,
	MODULES (HIM)	2	EA	90,000	180,000
3.	FRONT END PROCESSOR				
	(FEP)	2	EA	80,000	160,000
4.	VOICE AND DATA RECORDER		-		
	SYSTEM -	/	EA	30,000	30,000
. <u>5.</u>	UNINTERRUPTIBLE POWER				
	SUPPLY (UPS)	1	EA	70,000	70,000
6,	CONTROL CABLES	200	EA	1000	200,000
7	LONG RUN CABLES	46	EA	1000	46,000
8.	TERMINAL DISTRIBUTORS	5	EA	30,000	150,000
	FIRE CONTROL SYSTEM	/	EA	150,000	150,000
10.	PORTABLE TESTEQUIPMENT		_		
	FOR AVIONICS / ENGINE		SET.	150000	150,000
11.	OLSA PACK	1	EA	100,000	100,000
12.	STRIP CHART RECORDERS			,	
	(SCRS)	/	EA	60,000	60,000
13.	PROCESSED DATA RECORDER				
	CP54	/	EA	75,000	75,000
			V V.		
	<b>ジンア-</b> アロナルレ				93,771,000
		1			

·	EQUIPMENT PCN	DATE PREPA	RED		
		10-4	_	SHEE	T <u>94</u> of <u>/</u>
PROJECT	B INTEGRATION STU	צמצ			
	LRBEET HORIZONTAL	_	SSIN	5	CODE
FAC	CTIENGINES ENGINE SHOP, G	S.Eis	10-3	39 K50	
a lay da.		PH	. WA	SSUM	
DRAWING	NO. CHECKED BY			PPROVED BY	
	_			1	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED A
_/,	HYSTER LIFT TRUCK		2 12 13 2 2 2 3		
	(H70-0764)				\$900,0
<u> 2.</u>	ENGINE HORIZONTAL		·		
	INSTALLER (H70-0568				665,0
3.	ENGINE HANDLER				
-	(H90-0901)				460,0
4	ENGINE HANDLER SLIM	5	· ·		
	(470-0902)		·		16,0
5,	INTERFACE SUPPORT				
	PANEL (H70-0911)				75,0
6.	ROTATING SLING			•	
	(H70-0903)				400,0
7	ENGINE VERTICAL				
	INSTALLER (H70-0774)		-		1,250,0
8,	PROOF LOAD FIXTURE SE.			- · ·	
	(:70-0911)		5,		600,
9.	ENGINE MOVER SET				
	(H70-0890)				310
10.	ENGINE ALIGNMENT		· .		·
-	SET (A70-0645)	<u> </u>	<u> </u>		925,
11.	ENGINE COMPONENT				
	HANDLER SET (470-0905	1: 3:3	S. 3835		630
	ENGINE L'RUINSTALL				,
	REMOVAL SET (H70-0528)	,			1.150,0
13	ENGINE HANDLER				
1	MOVER				75
14.		7	r———		

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PROJECT	B INTEGRATION 37	UDY			
LOCATIO	"LRB & ET HORIZONTAL	PROCES	59/NG		CODE
ARCHITE	ILITY ENGINE SHOP, G.S.	Fallmurou.			
		P.H.C			
DRAWING	CHECKED BY		AF	PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
16.	INTERNAL INSPECTION				4
	EQUIPHENT (CTO-0907)	. ,			200,000
17.	TEST ADAPTER SET		· ·		
	(C70-0914)	2	EA	75,000	150,000
18,	FLOW TESTER (070-0903)	1			
	070-0904/070-0908)	2	EA	150,000	300,000
19.	REGULATOR PANEL				
	(C70-0743-X)	2	EA	32000	64,000
20.	ENGINE FLUSH AND	100			
	DRYING UNIT				500,000
21	THERMAL PROTECTION				
	SYSTEM WELDER	2	EA	25000	150,000
22	ENGINE COMMAND AND			,	
	DATA SIMULATOR				400,000
23,				, .	
	PLATFORM, VERTICAL				600,000
74		•			
<del>- 7</del>	LRB ENGINE ACCESS				5.50,000
25	LRB ENGINE ACCESS				
1	PLATFORMS, VERTICAL	4	EA	150,000	600,000
. 2/					<del></del>
60.	MANLIFT FOR ENGINE	4	EA	75000	300,000
27	PRIMARY GASEOUS HELIUM			77	<del></del>
-61.	REGULATOR PRIVEL				
	(570-0695-1)				250
1 —	,				
4	REGULATOR PANEL				
	(570-0695-2)	-	-		250,000
29	MASS SPECTROMETER STATION				200,000

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PROJECT	B INTEGRATION STUD	٠ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ			
LOCATIO	"LRB SET HORIZONTAL P ILITY ENGINE SHOP, G.	PROCES	151NG	K-5C	CODE
ARCHITE	CT/ENGINEER	ESTIMATOR R.	Mass	UM	
DRAWING	NO. CHECKED BY		AF	PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
•.	SUBTOTAL			>	22,032,500
	ESCALATION (1YR.)	5	%	•	1.101.625
	CONTINGENCY	15	%	·	, 3, 470, 119
	TOTAL			ئر	26,604.244
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	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE W	ORK SHEE	T	☐ CONSTRUCTION
۰0, ۲		DATE PREPAR	· ·	SHE	ET 124 OF 12A
ROJECT		10/2	9/88	3,12,	· · · · · · · · · · · · · · · · · · ·
	B INTEGRATION STUDE	/			
OCATIOI سترسیم	/ LRB HPF (102/142 AND 1	0-1001	C756	DOSS)	CODE
	CT/ENGINEER	ESTIMATOR	<b>4</b> 234		
		S. Z	3024	3	
RAWING	NO. CHECKED BY		^	PPROVED BY	
		T		UNIT PRICE	•
EM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	MATERIAL & LABOR	ESTIMATED AMOUNT
1.	SITE PREPARATION	262,800		500	1,314,000
2.	STRUCTURE			25.2	6,570,000
3.	ARCHITECTURAL			1000	2,628,000
41.	MECHANICAL			2500	6,570,000
5.	ELECTRICAL			1500	3,942,000
6.	2-30 TON CRANE				1,600,000
7.	ZO TOM CRAME		: • •		650,000
8.	2-5 TON HOISTS				60,000
<u>9.</u>	12" REINFORCED CONCRE	TE		•	
	APROH (190,000 SE)	23,200	<b>5</b> Y	32 00	743,000
10.	12" REINFORCED CONCRET	<u> </u>			
	TOWINAY (60,000 SF)	7,300	3/	32 00	234,000
<u>'/·</u>	OUTEITTING (20% OF				
-	BUILDING COST &			· · · · · · · · · · · · · · · · · · ·	
-	# 21.024,000)				4,205,000
					28,516,000
+	SUB OVERHEAD	15	%		4,278,000
	SUB PROFIT  PRIME MARK-UP	10	%		3.280.000
	BOND	10	%		3,607,000
$\neg$	ESCALATION (2 YEARS)	10.25			397,000
	CONTINUE MCH	15.25	%	•	4,108,000
**					6,628,000
					50, 514, 200
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	GROUND SUPPORT KSC PRELIMINARY COST			ET	☐ CONSTRUCTION
7. NO.	PCN	DATE PREPAR	ED	SHEE	T 18 OF 108
	B INTEGRATION STUD	)Y			
LOCATIO	B, HIGH BAY 4, LC-39	KSC			CODE
	CT/ENGINEER	ESTIMATOR P. N.	Ula:	SUM	
DRAWING	CHECKED BY			APPROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	FROM SHEET 2B			,	10. 690 560
	SUR DUERHERD	15	0/6		1,603.584
	SUB PROFIT	10	%		1, 229, 414
	PRIME MARKUP	10	%		1, 352, 356
	BOND	/	%		148,759
	ESCALATION (IVE.)	5	%		751,234
	CONTINGENCY	. 15	%		2,366,386
	SPECIAL CONDITIONS	10	%		1, 814, 229
				·	
			* * *		19,956,522
	TOTAL FACILITY			500	20,000,000
	70.72 772.7.1.4			J 777	20,000,000
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				•.,	
<b>,</b>					2. 18. 18. 19. 19. 19. 19. 19. 19. 19. 19. 19. 19
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3. PLATFORM STRUCTURAL  STEEL-EXTENSIBLE 1000 TON 30.  4. SUPPORTING STRUCTURAL  STEEL 700 TON 30.  5. PROESTAL TYPE IV (88 00018) 1 EA 172.  6. PROESTAL TYPE V (54,00018) 2 EA 103.	SHEET 28 OF 108
LRB INTEGRATION STUDY  LOCATION VAB, HIGH BAY 4, LC-39, KSC  ARCHITECT/ENGINEER  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED BY  CHECKED B	GOOL
DRAWING NO.  DESCRIPTION  LECTRICAL (SAME AS ON  ESTIMATED QUANTITY  UNIT ELA  ESTIMATE PCN 75899 AS  ESCALATED. LABOR 25000MH  HATEPIAL (SAME AS ON  ESTRUCTURAL STEEL-  DEMOLITION  3. PLATFORM STRUCTURAL  STEEL-EXTENSIBLE  STEEL  STEEL  STEEL  TOO TON 30.  5. PEDESTAL TYPE TUBE 2001B  LEA 172  6. PEDESTAL TYPE TUBE 2001B  PARTING STEEL TYPE TO 54001B  PARTING SERVER TO 1000  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  APPROVE	CODE
DRAWING NO.  CHECKED BY  CHECKED BY  APPROVED  APPROVED  ITEM NO.  DESCRIPTION  LECTRICAL (SAME AS AN  ESTIMATE PEN 75899 AS  ESCALATED. LABOR 25,000MH  HATERIAL 265,810)  LEA 890,  STRUCTURAL STEEL-  DEMOLITION  STEEL-EXTENSIBLE  STEEL-EXTENSIBLE  STEEL  STEEL  STEEL  STEEL  TOO TON 30  LEA 172  LEA 172  LEA 172  LEA 172  LEA 172  LEA 172  LEA 172  LEA 172  LEA 172  LEA 172  LEA 172  LEA 172  LEA 172	
DRAWING NO.  DESCRIPTION  DESCRIPTION  LECTRICAL (SAME AS AN ESTIMATED QUANTITY UNIT BATE ALA  ESTIMATE PCN 75899 AS  ESCALATED. LABOR 25000HH  HATERIAL (STEEL - DEMOLITION STEEL - STEEL - EXTENSIBLE 1000 TON 30  4. SUPPORTING STRUCTURAL STEEL - 700 TON 30  5. PEDESTAL TYPE IV (8800018) 1 EA 172  6. PEDESTAL TYPE IV (8800018) 2 EA 103	
ITEM NO. DESCRIPTION    ELECTRICAL (SAME AS AN ESTIMATED QUANTITY UNIT BLA   ESTIMATE PCN 75899 AS ESCALATED. LABOR 25,000HH     HATERIAL 265,810     EA 890,   2. STRUCTURAL STEEL-     DEMOLITION   5/2 TON 20,   3. PLATFORM STRUCTURAL     STEEL-EXTENSIBLE   1000 TON 30,   4. SUPPORTING STRUCTURAL     STEEL   700 TON 30,   5. PEDESTAL TYPE IV (88,000LB)   EA 172,   6. PEDESTAL TYPE IV (54,000LB)   2 EA 105,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,   1000 TON 30,	D BY
ITEM NO. DESCRIPTION ESTIMATED QUANTITY UNIT & LA  I. ELECTRICAL (SAME AS AN  ESTIMATE PCN 75899 AS  ESCALATED. LABOR 25,000HH  HATERIAL 265810) / EA 890,  2. STRUCTURAL STEEL-  DEMOLITION 5/2 TON 20  3. PLATFORM STRUCTURAL  STEEL-EXTENSIBLE 1000 TON 30.  4. SUPPORTING STRUCTURAL  STEEL  STEEL  700 TON 30.  5. PEDESTAL TYPE IV (88,000LB) / EA 172  6. PEDESTAL TYPE IV (54,000LB) 2 EA 10.5	
1. ELECTRICAL (SAME AS AN  ESTIMATE PCN 75899 AS  ESCALATED. LABOR 25,000HH  HATERIAL 265,810)  2. STRUCTURAL STEEL-  DEMOLITION  3. PLATFORM STRUCTURAL  STEEL-EXTENSIBLE  4. SUPPORTING STRUCTURAL  STEEL  STEEL  TOO TON 30.  5. PEDESTAL TYPE IV (88,00018)  1. EA 172  6. PEDESTAL TYPE IV (54,00018)  2. EA 103	ERIAL
ESTIMATE PCN 75899 AS  ESCALATED. LABOR 25,000HH  HATERIAL 265,810)  2. STRUCTURAL STEEL-  DEMOLITION  3. PLATFORM STRUCTURAL  STEEL-EXTENSIBLE  4. SUPPORTING STRUCTURAL  STEEL  STEEL  TOO TON 30.  5. PROESTAL TYPE IV (89,00018)  1 EA 172  6. PROESTAL TYPE IV (54,00018)  2 EA 103	ABOR ESTIMATED AMOUN
ESCALATED. LABOR 25,000HH  HATEPIAL 265,810)  2. STRUCTURAL STEEL-  DEMOLITION  3. PLATFORM STRUCTURAL  STEEL-EXTENSIBLE  STEEL TON 30.  4. SUPPORTING STRUCTURAL  STEEL  STEEL  TOO TON 30.  5. PEDESTAL TYPE IV (89,000LB)  1 EA 172.  6. PEDESTAL TYPE IV (54,000LB)  2 EA 10.5	
HATEPIALE 265,810)  2. STRUCTURAL STEEL-  DEMOLITION  3. PLATFORM STRUCTURAL  STEEL-EXTENSIBLE  4. SUPPORTING STRUCTURAL  STEEL  STEEL  700 TON 30  5. PROESTAL TYPE IV (88,00018)  1 EA 172  6. PROESTAL TYPE IV (54,00018)  2 EA 103	
2. STRUCTURAL STEEL-  DEMOLITION 5/2 TON 20  3. PLATFORM STRUCTURAL  STEEL-EXTENSIBLE 1000 TON 30.  4. SUPPORTING STRUCTURAL  STEEL 700 TON 30.  5. PROESTAL TYPE IV (88,000LB) 1 EA 172.  6. PROESTAL TYPE IV (54,000LB) 2 EA 103.	810 890.810
DEMOLITION 5/2 TON 20 3. PLATFORM STRUCTURAL  STEEL-EXTENSIBLE 1000 TON 30.  4. SUPPORTING STRUCTURAL  STEEL 700 TON 30.  5. PEDESTAL TYPE IV (88,00018) 1 EA 172.  6. PEDESTAL TYPE IV (54,00018) 2 EA 103.	
STEEL-EXTENSIBLE 1000 TON 30.  4. SUPPORTING STRUCTURAL  STEEL 700 TON 30.  5. PEDESTAL TYPE IV (88,00018) 1 EA 172.  6. PEDESTAL TYPE IV (54,00018) 2 EA 103.	000 1,024,00
4. SUPPORTING STRUCTURAL  STEEL 700 TON 30  5. PROESTAL TYPE IV (88,00018)   EA 172  6. PROESTAL TYPE V (54,00018) 2 EA 103	
STEEL 700 TON 30 5. PEDESTAL TYPE IV (88,000LB) 1 EA 172 6. PEDESTAL TYPE V (54,000LB) 2 EA 103	39 3,039,00
5. PEDESTAL TYPE IV (88 00018)   EA 172 6. PEDESTAL TYPE V (54 00018) 2 EA 103	
6. PEDESTAL TYPE V (54,00018) 2 EA 105	039 2,1273
	7,500 172,50
- /   FEDESTAL / UDE   / (4/ AM) RI	5,000 210,00
	1,250 243,7
8. EXTERNAL DRIVE MECH.  EDR PLATEROUS GEA 40	2,000 240,0
9. Aux PLATFORMS STRUCTURAL	270,0
/ / / CA / CA / CA / CA / CA / CA / CA	4,000 288.00
10. ITON JIB CRANES 6 EA 3	4000 2400
11. 5 TON TIB CRANES 6 EA 12	2000 72.00
	3200 1.69920
	0,000 600,00
14. ELECTRICAL CABLES 60 EA 1	60,00
	10,690,53
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	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO	RK SHEET	. [	CONSTRUCTION
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PROJECT	B INTEGRATION STUDY				
LOCATIO	" GSE, HIGH BAY 4, VAB,	YSC			CODE
	CT/ENGINEER	R. H. L	JASS	14	
DRAWING	HO: CHECKED BY		AP	PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
1.	LRB FUEL & OXIDIZER VENT				
	VALVE ACTUATION PAINEL				\$
	(SIMILAR TO 572-0680-01	2	EA	175,000	350,000
2,	STAINLESS STEEL TUBING	/	LOT	40,000	40,000
3,	NEW 9099 ELECTRICAL		Ma		
	INTERFACE	. /	EA	150,000	150,000
4.	TERHINAL DISTRIBUTORS	5	EA	15,000	75,000
5,	PYRO TEST DISTRIBUTOR	/	EA	45,000	45,000
6.	LPS SIGNAL ADAPTER		EA	80,000	80,000
7	MODIFY EXISTING DC				
	POWER PANEL	/	EA	8,000	8,000
8.	HODIFY EXISTING HIM	/	EA	12,000	12,000
9.	MODIFY EXISTING TERMINAL				
	DISTR.	2	EA	10,000	20,000
10	MODIFY EXISTING PANEL			,	
	(SAME AS ITEM 1)	1	EA	80000	80,000
					860,000
	SUB OVERHEAD	15			129,000
	SUB PROFIT	10	%		98 900
	PRIME MARKUP	10	%		108,790
	BOND	1	%		11,967
	ESCALATION (IYE)		%		60.433
•	CONTINGENICY	15	0/,		190.363
0.1	SASCIAL CONDITIONS	<u> </u>	2.5		14=94=
					1.605.513
					<i>y</i>
	TOTAL GSE			SAY	7,610,000
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	GROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO	ORK SHEET	r	☐ CONSTRUCTION
Э. НО.	PCN.	DATE PREPAR		SHEET	48 or 108
PROJECT	B INTEGRATION STUD				
			B, 41	5H	CODE
ARCHITE	OH FACILITY MODIFICATION CT/ENGINEER	ESTIMATOR P. H.			
DRAWING	NO. CHECKED BY			PROVED BY	•
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	TINU	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	DELTA COSTS FOR LOS /RP.1				
	PRESS (GDCC) AND LOS/LA				
	CONFIGURATIONS:	,	•		,
1.	EXTENSIBLE PLATFORMS				\$
	A-36 STEEL	200	TONS	3039	607,900
2.	SUPPORTING STRUCTURE				
	A-36 STEEL	140	TONS	3039	425,460
3.	EXTERNAL DRIVE MECH.	·			
	FOR PLATFORMS	2	EA	40,000	80000
4	1-TON JIB CRANE	2	EA	4,000	8.000
5.	5-TON JIB CRANE	Z	EA	12,000	24,000
6.	ELECTRICAL -	; <u>/</u>	407	20000	200,000
			•		
					1,345,260
	SUB OVERHEAD	15	%		201.789
	SUB PROFIT	10	%		154.705
	PRIME MARKUP	10	0/6		170,175
1	BOND	1	%		18.719
	ESCALATION (IYE.)	5	6/6		94.532
i	CONTINGENCY	15	%		297.777
	SPECIAL CONDITIONS	.10	%		228, 296
				· · · · :	2,511, 254
					,
	TOT-2 = 4 2 - 1 = 1 = 1 = 1 = 1			SEZ	72, 331 20
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□ g	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE W	ORK SHEE	<b>T</b>	☐ CONSTRUCTION
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PROJECT		10-1-	88		• • • • • • • • • • • • • • • • • • • •
LR	B INTEGRATION STU	DY			
	B, HIGH BAY 3, LC-39				CODE
ARCHITE	CT/ENGINEER	ESTIMATOR			
		R.H.L			
DRAWING	NO. CHECKED BY		^'	PPROVED BY	
		ESTIMATED	<del>                                     </del>	UNIT PRICE	
TEM NO.	DESCRIPTION	QUANTITY	UNIT	& LABOR	ESTIMATED AMOUNT
	FROM SHEET 63				3,840,010
	SUB OVERHEAD		%	*	576,002
	SUB PROFIT	10	%		441,601
	PRIME MARKUP	10	%		485, 76/
	BOND		/0		53, 434
	ESCALATION	- 5	0/0	<u> </u>	269,840
	CONTINGENCY	15			849, 997
	SPECIAL CONDITIONS	15	0/2		977, 497
			·		7, 494, 142
					7 50000
	TOTAL FACILITY	•	·	SAY	7, 500,000
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E	ROUND SUPPORT KSC PRELIMINARY COST	T ESTIMATE W	ORK SHEE	<b>T</b>	CONSTRUCTION
0. NO.	PCN	DATE PREPAR		SHEE	6B OF 10B
PROJECT		1			
LOCATION	B INTEGRATION STUD	<b>/</b>			CODE
VAL	3, HIGH BAY 3, LC-39	K5C			
ARCHITEC	ST/ENGINEER	R.H. W	Acell		
DRAWING	NO. CHECKED BY	1~.//		PPROVED BY	
TEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUN
-	ELECTRICAL (SAME ASO	•	UNIT	& LABOR	ESTIMATED AMOUN
. ,	ESTIMATE PCN 25899 AS				
	ESCALATED. LABOR 25,000	1	· ·		
	MH MATERIAL \$265,810		EA	890,810	890,8
_ +	MODIFY EXISTING EXTEN-				
1	SIBLE PLATFORMS, STEEL	1	EA	30,000	540,0
3.	AUX. ALUMINUM PLATFORM	5			·
	(5RB-AB@ 1000 LB)	16	EA	20,000	320,00
4.	AUX. AL PLATFORMS				
	(LRB @ 2000 LB)	2	EA	20,000	40,00
5.	MODIFY EXISTING AUX.			·	
	ALUMINUM PLATFORM	14	EA	15,000	210,00
6.	MODIFY SUPERSTRUCTURE		LOT	100,000	100,0
	ECS STATIONS	6	EA	283,200	
8.	ELECTRICAL CABLES	40	EA	1,000	40,00
					2 0 / 2 0 /
	SUB-TOTAL				3,840,01
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	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO	ORK SHEE	<b>T</b>	☐ CONSTRUCTION
7. NO.	PCN	DATE PREPAR		SHEET	7B of 10B
PROJECT					
LOCATIO	"GSE, HIGH BAY 3, VAL	3, KSC			CODE
ARCHITE	CT/ENGINEER	ESTIMATOR			
DRAWING	HO. CHECKED BY		A	PPROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
• •	FROM SHEET 83	,*			582,000
	548 OVERHEAD	15	%		87,300
•	SUB PROFIT	10	%		66,930
	PRIME MARKUP	10	%		73,623
	BOND		%		8,099
	ESCALATION (IYE)	5	0/0		40,899
	PONTINGENCY	15	%		128827
	SPECIAL CONDITIONS	15	%		148,151
				!	1,135,829
					•
•	TOTAL GSE				1,140,000
1					•
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	GROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE W	ORK SHEE	T	☐ CONSTRUCTION
<b>w</b> 3	PG#	DATE PREPAR	17.7	SHEE	88 of 108
PROJECT	28 INTEGRATION ST	UDY			
LOCATIO	"GSE, HIGHBAY 3, VI	4B, K.	<b>3</b> C		CODE
ARCHITE	CCT/ENGINEER	ESTIMATOR			
DRAWING	CHECKED BY		A	PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
1.	LRB FUEL & OXIDIZER			* ':	
_	VENT VALVE ACTUATION				
	PANEL (SIMILAR TO		·		
	572-0680-01)	.2	EA	175000	350,000
2,	STAINLESS STEEL TUBING	1	LOT	20000	1 <u>a</u> 5
3.	MODIFICATIONS TO 9099				
	ELECTRICAL INTERFACE	1	EA	50000	50,000
_ 11_	MODIFICATION TO LRB			7,000	
	FUEL & OXIDIZER PANEL	1	EA	80000	80,000
5.	MOD TO TERMINAL				
	DISTRIBUTORS	4	FA	10 000	40,000
6.	MOD TO PATCH DISTRIBUTOR	و			
	PANEL	1	EA	12,000	12,000
7.	MOD TO PYRO TEST				
	DISTR	/	EA	15,000	15,000
₽.	HOD TO LPS SIGNAL				
	ADAPTER	7	EA	10,000	10,000
9.	HOO TO HIM	1	EA	5000	5000
	[1] M. M. Waller, M. Waller, A. Waller, Phys. Lett. B 50, 120 (1997).			7	
	SUB- TOTAL				\$ 582,000
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	QUIPMENT	DAME BASS	D	<del>-                                    </del>	
. но.	PCN	10-3	-88	SHEET	98 of 108
PROJECT	B INTEGRATION ST	"UDY			
LOCATION	VAB CRAWLERWAY, LC	-39, K	50		CODE
ARCHITEC	CT/ENGINEER	ESTIMATOR.	1//A < <	-//H	And the second of
DRAWING	NO. CHECKED BY	1	AP	PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOU
/ /	REINFORCED CONCRETE CROSS -			11	
	OVERS FOR CRAWLERWAY !				
,	CONCRETE.	569.9	CY	200,	113,98
	#8 REINFORCING BAR	41.0	TONS		21,36
. ,	# 6 REINFORCING BAR	69.0	TONS	-	35,88
	DEWATERING	8	LOTS	16,000	128,00
2	RELOCATE OFF HODILA	e			
	HOUSING		EA	400,000	400,0
3.	DEMOLITION:		,		
	RAILROAD (250LF)	250	LF	20	5,0
_	ASPHALT PARKING AREA			<u></u>	
	48,000 SF	9007	5.4	4	3,6
	FENCE (8'HIGH-160LF)	. /	207	600	6
•	12" POTRBLE WATER LINE	160	LF	40	6,4
	8" SANITARY SEWER LINE	160	LF	5	80
	15KY DUCT BANK	160	LF	30	4,8
	PREVIOUS FILL OVER	1:			
	CLAWLERWAY	41,482	CY	-5	207, 4
	COMM DUCT BANK	600	LF	30	18,0
	COMM MANHOLE	2	EA	2000	4,0
	POWER MANHOLE	<u>/</u>	EA	2000	2,0
		200	20	10	Q,
4.	8 GATE X 145LF		EA	20000	2,0
	Opicion conser Since	5,263	22	5/	310 51
	BASE MAYERS	31,572	124	35	1,105 113
7.	RAILROAD ENDING		=A	OPICINAL	500
8.	12" POTABLE WATERLIN	E 180	LE	ORIGINAL OF POOR	770
		E 300			QUALITY 00

	GROUND SUPPORT KSC PRELIMINARY COST ESTIMATE WORK SHEET EQUIPMENT								
э. но.	PCN		10-3		SHEE	108 OF 108			
PROJECT LE	LRBINTEGRATION STUDY								
LOCATIO	"VAB CRAWLE	PWAY L	C-39, 1	<del>-5</del>	?	CODE			
ARCHITE	CT/ENGINEER		ESTIMATOR .	WAS	SUM.				
DRAWING	NO.	CHECKED BY		^	PPROVED BY	•			
ITEM NO.	DESCRIPTION		ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT			
10.	15KV DULT BAN	IK	200	LF	60	\$ 12,000			
11.	PAMM. DUCT BA		900	LF	60	48,000			
12	POWER MANNO		/	EA	5000	5000			
13.	FIREX LINE	8 *	220	LF	60	13,200			
14.	RELOCATE 14"C.L	W. LINES	320	2/=	112.5	16,000			
15.	RELOCATE 4"C.	W. LINES	320	LF	30	9,600			
16.	RELOCATE 2" LIN	ES GHOÉGN	320	LF	25	8,000			
						2,532,737			
	SUB OVERHEAD	2	15	0/6		379,911			
	SUB PROFIT		10	%		291,265			
	PRIME MARKU	P	10	%		320,391			
	BOND		/	1/0		35,243			
٠.	ESCALATION (1	YE.)	5	%		177,977			
	CONTINGENCY		15	0/0		560,629			
						4,298,153			
		TOTAL			SAY	4,298,153			
					<u> </u>				
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	QUIPMENT	CATE ODERADE	ń		
, NO.	QUIPMENT KSC PRELIMINARY COST	9-13	g - 55	SHEET	16 of 156
ROJECT	RB INTEGRATION STUE				
ACTION					CODE
	AB MLP 4 - ALL LOS	CATIMA TOR			
ARCHITEC	T/ENGINEER		BUR	13	
DRAWING	NO. CHECKED BY		AP	PROVED BY	
TEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UMIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
I EM RO.					
	SUNJARY				·
·	FACILITH		•		51,863,000
	15E				22,881,000
	<b>65</b> E				35, 247,00
	ALE SERVICES				20, 402,00
	TTV				17, 915,00
	INITIAL SPARKS			-	4,351,00
	SUB- TOTAL				153,159,000
		,,,,,,			, , , , , , , , , ,
•	ACTIVATION	15%	<b></b>		× 1.15
	MANAGENTEUT				
	TOTAL				176,133,00
· ·	77.72				
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	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO	ORK SHEET		CONSTRUCTION
NO.	QUIPMENT		6-33		26 of 156
PROJECT	LAB INTEGRATION STUDY				
LOCATIO	LAB MLP #4 - ALL LO2 ,	RP-1			CODE
1.	CT/ENGINEEN	FETIMATOR :			
DRAWING	NO. CHECKED BY		AF	PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	FACILITY REQUIRENGENT				
	SUMMARY -		· · · · · ·		
	STRUCTURAL				16,260,000
	ARCHITECTURAL				1,172,000
	ELECTRICAL				5,250,000
	MECHANICAL				5,715,000
	JUB- TOTAL				28,397,000
					· · · · · · · · · · · · · · · · · · ·
	SUB OVERHEAD	15%			× 1.15
	SUB PROFIT	10%			× 1.10
	PRIME O/H & PROFIT	10%			× 1.10
	BOND	10/0			× 1.01
	CONTINGENCY	13.%			× 1.13
	CONTINGENCY	15%			x 1.15
	TOTAL  (TO SHEET 1)				51,863,000
	(TO SHEET 1)				
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EC	ROUND SUPPORT KSC PRELIMINARY COST				CONSTRUCTION
NO.	PCH	DATE PREPARE	· - 55	SHEET	36 OF 156
PROJECT	RB INTEGRATION STUDY				
		/ ZP-1			CODE
	T/ENGINEER	ESTIMATOR	BURN	1.0	
DRAWING I	NO. CHECKED BY		APP	ROVED BY	•
TEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	LAUNCH SUPPORT			. — –	
	EQUIPMENT SUMMARY				
	E 4 U / 1 - ME - CI				
	FABRICATION -				15,400,000
	ESCALATION	13%			× 1.13
·	CONTINGENCY	15%			× 1.15
			ļ		
	SUB- TOTAL				20,013,000
	DAVIS - BACON -			· · · · · · · · · · · · · · · · · · ·	1,570,000
	SUB OVER HEAD	15%			× 1.15
	SUB PROFIT	10%			× 1.10
	PRIME OIH & PROFIT	10%		<u> </u>	× 1.10
	BOND	1%			× 1.01
	ESCALATION	13%			× 1.13
	CONTINGENCY	15%			1.15
				· · · · · · · · · · · · · · · · · · ·	2 4 5 55
	SUZ-TOTAL				2,868,000
					22 881 000
	(TO -1==- 1)				
	(76 7, - 7)				
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NO.	QUIPMENT	DATE PREPARE		SHEET	46 of 156
PROJECT	LRB INTEGRATION STUD	4			
				en en en en en en en en en en en en en e	CODE
ARCHITEC	TYENGINGER	ESTIMATOR 5,	BURLA		
DRAWING	NO. CHECKED BY			VED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	M.	IT PRICE ATERIAL LABOR	ESTIMATED AMOUNT
	GROUND SUPPORT			· .	:
·	EQUIPMENT SUMMARY				
	FABRICATION -			u por mar a de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la com	21, 737,000
-		·			
	ESCALATION	13%		·	x 1.13
· ·	CONTINGENCY	15%			× 1.15
				-	
	SUB. TOTAL				28,3/3,000
					3,796,000
	DAVIS - BACON -				3, 7,0,000
4					, ,
	SUB OVERHEAD	15%			x 1.15
	SUB PROFIT	10%			× 1.10
* .	PRIME OH & PROFIT	10%		·	* 1.10
	BOND	1%			x 1.01
	ESCALATION	13%		<u> </u>	× 1.13
	CONTINGENCY	15%			* 1.15
, ,				· .	
	SUB-TOTAL	_			6,734,000
					1
	TOTAL CONTRACTOR	4 3 3 3 3 3 4 4			35 247,000
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	ROUND SUPPORT KSC PRELIMINARY COST			<b>)</b>	CONSTRUCTION
	QUIPMENT		16-38	SHEET	56 OF 156
PROJECT	AB INTEGRATION STUD	4			
1.0047104					CODE
	T/ENGINEER	ESTIMATOR 5	· · · · <u>·</u> · · ·	2~4	
DRAWING	NO. CHECKED BY		AP	PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	TINU	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	FACILITY REQUIREMENTS				
	STRUCTURAL -				
	SUPERSTRUCTURE	4200	TONS	3300	13,860,000
	FALSENORK	1000	TONS	2400	2,400,000
			· .		
	-SUB-TOTAL	-			16,260,000
	(TO SHEET 2)				
	ARCHITECTURAL -				
	PAINT	185000		3 00	550,000
	FLOORING	20000	52	1100	220,000
	INSULATION	20000	55	92	180,000
	DOORS   HATCHES	60	EA	3700	222,000
					·
	SUB - TOTAL				1,172,000
	(TO SHEET 2)				
	ELECTRICAL -				
	AL POWIET	1	LOT	3600	3,600,000
	SUB STATIONS	2	E4	600×	1, 200,000
	L1612 TINIG	1	100	240 X	240,000
5 de 12	FIRE DETECTION	1	LOT	160 %	160,000
	PAGING / ANT		LOT	50 K	50,000
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	TOTAL				7-7-
	7-3-5-767A2 7-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3				

□ GI	ROUND SUPPORT KSC PRELIMINARY COST				☐ CONSTRUCTION
.0. 1	PCN	DATE PREPARE	16-89	SHEET	66 of 156
ROJECT	RB INTEGRATION STUD	04			
OCATION	RB MLP 4 - ALL LO	/RP-	<i>j</i> .		CODE
RCHITEC	T/ENGINEER	ESTIMATOR	, BU	2~15	
RAWING	NO. CHECKED BY		AP	PROVED BY	
EM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	MECHANICAL -				
	HVAC	1	LOT	11102	1,110,000
	ECS	1	207	600 K	600,000
	SOUND SUPPRESSION/	7	LOT	1370 ~	1,370,000
	QUENCH HZD		,		
	OVERPRESSURE	1	LOT	575 X	575,000
	FIRE SUPPRESSION	1	10T	810×	810,000
	H20 / WNSTE	1	LOT	100	100,000
	PHEUMATICS	1	LOT	1090K	1,090,000
				All Market or common (*)	
	SUB- TOTAL		• •		5,715,000
	(TO SHEET 2)				
			• • • • • • • • • • • • • • • • • • • •		·
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	British British British A. British British British				
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	QUIPMENT.	DATE PREPARE	io - 69	1 414	76 OF 156
ROJECT	RB THEGRATION STUDE				
OCATION			1		CODE
	T/ENGINEER		BURN	15	
RAWING P	NO. CHECKED BY		AP	PROVED BY	
EM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUN
	LAUNCH SUPPORT			:	
	EQUIPMENT (LSE)				
	FABRICATION CONTRACTS-				
	TAIL SERVICE MAST	2	EA	3840×	7,700,000
		8	EA	100 K	800,00
	LIFT- OFF UMBILICAL	Z	EA	3100 K	6,200,00
			27		
	(102)	2	EA	350 ^K	700,000
	RP-1 UMBILICAL		EA	770	700,000
				•	15.400.00
	SUB- TOTAL				15,400,00
	(TO SHEET 3)			*. •	
	DAVIS - BACON -	<del> </del>		<u> </u>	
	ELIGINE SERVICE				
	PLATFORM (ESP)	-	· ·	151 K	
	SUPERSTRUCTURE	3	E4.		453,000
	ACCESS PLEMS:		387	634	139.000
·	401575	12	EA	542	543,00
17:3.7	ESP SUB-TOTAL	Appendication	and the		1,290,00
		2	EA.	40 %	<b>5</b> 0 50
	7584 1215-1224 ·	<b>a</b> .		- 10	
		3	EA		÷ .
		2	<u> </u>	-1 -	* - J
	<u> </u>			1	
					1.570,00
	JUB - TOTAL  (TO SHEET 3)	-	-		., , , , , , , , , , , , , , , , , , ,

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. NO.	QUIPMENT		16 - 89		36 OF 150
PROJECT	LRB INTEGRATION ST	DU			
· · · · · · · · · · · · · · · · · · ·					CODE
DRAWING I	NO. CHECKED BY				
		ESTIMATED		UNIT PRICE	ESTIMATER ANGLE
ITEM NO.	DESCRIPTION	YTTHAUP	UNIT	& LABOR	ESTIMATED AMOU
	GROUND SUPPORT				
	EQUIPMENT (GSE)				
	FABRICATION CONTRACTS	_			
	ORB /ET MECHANICAL		LOT		4,158,00
	ORB /ET ELECTRICAL	/	207		8,913,00
	LEB MECHANICAL	1	LOT		5, 779,00
	LRB ELECTRICAL	/	LOT	-	3,337,0
	SUB-TOTAL (TO SHEET 4)				21,787,00
· ·	(TO SHEET H)				
•	DAVIS - BACON -				_
-	ORB ET MECHANICAL	1	LOT		1,051,00
	ORB LET ELECTRICAL	/	207		1,006,00
	LRB MECHANICAL	/	207		1,361,0
	LRB ELECTRICAL	/	LOT		378.0
					2 52 -
	SUB-TOTAL (TO SHEET 4)				3,796,0
· · · · · · · · · · · · · · · · · · ·	(TO SHEET 4)		<del>                                     </del>	<u> </u>	
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. NO.	PCH	DATE PREPARI	e0 • - 35	SHEET	92 OF 15
PROJECT	RB INTEGRATION STUD	<del>-</del>			
1 561 7161					CODE
	T/ENGINEEA	ESTIMATOR			
DRAWING	NO. CHECKED BY			PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	ÜNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AM
	A/E SERVICES				•
	7/2				
	FACILITY REQUIRENTE	U75-	·		
	PER \$51,863,000				
	× .01%				
	519,000				519,00
			·		
	DESIGN \$51,863,000	2		-	
	× .08%		<u> </u>		
				<u> </u>	· .
	4,150,000				4,150,0
				•	
<u>-</u> .	51E5 #51,863,000				
	× 10°/0	•			
	5,187,000				5,187,0
	JUB. TOTAL				9,956,
	LAUNCH SUPPORT				
	T. C. C. C. C. C. C. C. C. C. C. C. C. C.				
	751, 85				
	× , C1 ",0		<u> </u>		
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	ROUND SUPPORT	KSC PRELIMINAR	r COST E	STIMATE WO	RK SHEET		☐ CONSTRUCTION
		CN		DATE PREPARE		SHEET	106 OF 156
				7-16	- 55		
PROJECT	LRB INTEG	RATION S	アレロー	/			CODE
							CODE
ARCHITEC				POLISIMA I ALL "	_ جيد		
SSAWING	NO.	CHECKED BY			APP	ROVED BY	
DUVALINA						e en g	<u>.</u>
ITEM NO.	DI	ESCRIPTION		ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
ITEM NO.		CES (CON'	7.)				
	DESIGN						
		* .0	8 %				
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		1,831,	000	· · · · · · · · · · · · · · · · · · ·			1,831,000
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	5185	* 22,881	,				
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		2,288	000				2,288,000
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		SUB - TOTA	44				4,348,000
				* * * * * * * * * * * * * * * * * * *			
	GROUND	SUPPORT					
	EQUIPA1						
	PER	* 35 247	000				
	<u> </u>	<u> </u>	01%				
							353,000
		343.0					The transit of the contract.
	カミディル	# = 5 24					,
			- 5 グ.				
		2,820	. 2:2:2		<del></del>	DIOINAL S	2,510 77.
						RIGINAL PA	
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. NO.	P	CN-	DATE PREP	ARED	SHEET	116 OF 156
ROJECT						
		RATION 5				CODE
	LAB MILP	H - ALL	1 FETIMATOR			
		CHECKED BY			PROVED BY	
DRAWING	NO.	CHECKED BY				
NO	ns.	SCRIPTION	ESTIMATE:	D. UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
TEM HO.		ICES (COU'T				
	5185	\$ 35,247,0	00		-	
		× . 10	%			
		3,525,00	00		ļ. ·	3,525,000
				_		
		UB - TOTAL		<del></del>	•	6.698.000
		<u> </u>	· · · · · · · · · · · · · · · · · · ·			
						20,902,000
-		TOTAL	<del>-  </del>			20, 102,000
		(TO SHEET )				
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☐ GR	OUND SUPPORT	KSC PR	ELIMINARY COST	ESTIMATE WO	RK SHEET		CONSTRUCTIO
	UIPMEN I			CATE BOSDADS	D.		
. NO.		PCN		9-11	, - 32	SHEET	126 OF 15
PROJECT		1		L			
L2	RB INTEG	BATION	1 STUDY				
							CODE
	RB HLP	4 -	ALL LU	1 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7			
ARCHITECT	/ENGINEER			<u> </u>	BURK	15	
DRAWING N	<b>0.</b>		HECKED BY		AP	PROVED BY	
				######################################	1.	UNIT PRICE	
ITEM NO.		ESCRIPTION		QUANTITY:	UNIT	& LABOR	ESTIMATED AMO
	TEST, TE	BAIN.	ATION AM		. •		
	VERIFICA	TION	(TTV)				
		<del> </del>				·	
			17 -				
	MAUPONIE		130	-			
	MHRS /40				<del></del>		
	18 MONT	45	× 1.5				
	DUR ATION	<u></u>				- и	
			390,000	390000	MHR.	#350	13,650,0
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		Tiou	10 MID	3.75%		-	× 1.0375
		•					
	POINT 4			15%			* 1.15
· -	CONTIN	GENCL	1	1			
	SIES			10%			× 1,10
					· · · ·		
	TOTAL						17,915,0
	(10	3HEET	1)				
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□ GI	ROUND SUPPORT KSC PRELIMINARY COST				CONSTRUCTION
	PCN		4- 22		136 OF 156
PROJECT	RB INTEGRATION STU	DY			
OCATION	RB MIP # 4 - ALL LO				CODE
	T/ENGINEER	ESTIMATOR	BUZZ	14	
DRAWING I	O. CHECKED BY		AF	PROVED BY	
TEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	INITIAL SPARES -				
	9% OF LSE AND	-			
	GSE FABRICATION				
	COSTS	,			
·	15E 20,013,000				and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s
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	× .09%		· · · · · · · · · · · · · · · · · · ·		
					1,802,00
	1,802,000				7,002,00
	GSE \$ 28, 313,000				· · ·
	× .09%				
	2,549,000				2,549,00
	2,549,000				
		-			
	TOTAL				4,351,00
	(TO SHEET I)				
	The state of the filter of the filter of the filter of the				
				Switz (Salar	
	The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s				•
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□ G	ROUND SUPPORT KSC PRELIMINARY C	COST ESTIMATE W	ORK SHEE	ET.	CONSTRUCTION
N	PCN	DATE PREPAR	1ED	SHEET	146 or 156
ECT PB					
TION 713	MLD 4 025 - 202/1		בים בים	ZATION	CODE
		ESTIMATOR	3084	4	
ING I	CHECKED BY			APPROVED BY	
NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	102 / LHZ LSE-				
-		_			
<u>'-</u>	FABRICATION CONTRACT		EA	2750*	5,500,000
	LHZ ONLY			,	
$\dashv$	(3100 H - 350 H = 2750 1	<u>()</u>	<del> </del>		
$\dashv$					
-	ESCALATION	/3	%		× 1.13
_	CONTINGENCY	15	%		× 1.15
$\dashv$	155				7,148,000
7	LSE TOTAL	•			1,140,000
	ALE SERVICES				
	PER		2/0		72,000
	DESIGN	8	%		572,000
	SIES	10	%		715,000
$\dashv$	ALE TOTAL				1,359,000
	INITIAL SPARES	9	%		644.000
	Final Colonia de Calendario de Calendario de Calendario de Calendario de Calendario de Calendario de Calendario La constancia de Calendario de Calendario de Calendario de Calendario de Calendario de Calendario de Calendario				
	SUB-TOTAL				a 151 000
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☐ E	ROUND SUPPORT QUIPMENT	KSC PRELIMINARY COST	ESTIMATE WO	RK SHEET	r 	CONSTRUCTION
0. NO.	•	**	DATE PREPAR		SHEET	156 of 150
PROJECT		TION STUDY		2.0		ara (A. K. G., 1961).
		LH2 , LC-39,		P. 5,	KSC	CODE
ARCHITE	CT/ENGINEEA		ESTIMATOR			
DRAWING	NO.	CHECKED BY	R.H.		PROVED BY	
J.C.A.J.IA.G		One One One			* ;	
ITEM NO.	DE	SCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOU
		S FOR LOZ/LH2				
	MECHANICAL					4
1		DUCER PANEL	2	EA	55,000	110,00
2,	GHE ANTI	-ICE PANEL	2	EA	115,000	230,0
3.	LHZ VENTLI.	N GHE PURGE				
	PANEL		2	E4	90,000	180,
4	LH2 VENT	LINE PRESSURE		<u></u>	,	
	AND PURG		2	EA	115000	230
5		T AN ADDITION		•		
	AL COST OF	<b></b> .	400	LF	2400	96000
	ELECTRIC	. /				
	ADDITIONAL				:	
						1,710,000
.*	SUB OVER	HEAD	15	%		256,50
7	SUB PROFI	<del>7</del>	10	%		196,60
	PRIME MAR		10	%		216, 3
	BOND			%		23.7
	ESCALATION	v (2.575)	13	%		312,4
	CONTINGENO	- /	15	%		4073
						3,123,03
· 13 43 =				erg. Tatescr		4
	To-742 78.				SAY	P 5,00,00
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NO.	QUIPMENT	DATE PREPARI	ED - 7 - 8 =	SHEET	1D of BI
PROJECT	AB INTEGRATION STUD				
· · · · · · · · · · · · · · · · · · ·			7		CODE
ARCHITEC	T/ENGINEER	ESTIMATOR 5		45	
DRAWING N	CHECKED BY		AP	PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOU
	SULTHARY				
	FACILITY (REE MLP"	<del>-</del> /)			51,363,0
	45E				13,021,0
	GSE				22,017,0
	ALE SERVICES			. •	13,906,0
	TTV (REF MLP # 4)				17,915,0
	INITIAL SPARES				1, 421, 0
-+	LAIIIAG DPARES				
<del>.          </del>					120,643,0
	SUB- TOTAL				, = -, -, -, -, -, -, -, -, -, -, -, -, -,
<del></del>	1	15%			× 1.15
	ACTIVATION				
	MANAGEMENT				
	——————————————————————————————————————				138,740,0
	TOTAL				/50, / <del>7</del> 0, 0
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~	PCN	DATE PREPARE		CHEET	2 D of 8:
·		9-19	- 55	JACET	
PROJECT	AB INTEGRATION STUDE				
					CODE
•	RB MLP 5 - ALL 200	I ESTIMATOR			
ARCHITEC	TYENGNEER		BUR	45	
DRAWING	NO. CHECKED BY		AP	PROVED BY	
				UNIT PRICE	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	MATERIAL & LABOR	ESTIMATED AMO
	LAUNCH SUPPORT				
	EQUIPMENT SUMMARL				
	FABRICATION -				7,700,00
	ESCALATION	13%			× 1.13
	CONTINGENCY	15%			× 1.15
	SUB- TOTAL				10,007,0
•					
				·	
	DAVIS - BACON -				1,650,0
			·		
	SUB OVERHEAD	15%			× 1.15
	SUB PROFIT				× 1.10
	PRIME OLH & PROFIT	10%			× 1.10
	BOND	10%			× 1.01
1.485 4.	ESCALATION	13%			· · · / · / 3
	CONTINGENCY	15%		·	¥ 1.15
					-
	SUB-TOTAL				3,014,00
				11.5	17 -21 -
	Total-				13 521 -
	(- 5465- 1				
		,			
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	ROUND SUPPORT KS	C PRELIMINARY COST	ESTIMATE WO	RK SHEE	T	☐ CONSTRUCTION
w 0.	PCN		DATE PREPARE	10 21 - 23 -	SHEE	7 3 D of 3 D
PROJECT	RB INTEGRATI	ON STUDY				
	DB MLP # 5 -	ALL LOZ	/RP-1			CODE
ARCHITE	CT/ENGINEER		ESTIMATOR 5. 73	SURV.	5	
DRAWING	NO.	ALL LOS		^	PPROVED BY	•
	·		ESTIMATED		UNIT PRICE	ESTIMATED AMOUNT
ITEM NO.			QUANTITY	UNIT	& LABOR	E31 IMA 1ED AMOUNT
	GROUND SUF	PORT	-		<u> </u>	
	EQUIPMENT	SUNJAJARY				
	FABRICATION	/ —				5,716,000
	ESCALATION	J .	13%			× 1.13
	CONTINGE		15%			× 1.15
		<b>/</b>			-	
	50	B-TOTAL				11,327,000
			-	,		
	DAVIS - BACON					5,853,000
		<del></del>				
	SUB OVER	HEAD	15%			x 1.15
	3UB PEO!	=, = 1	10%			× 1.10
	PRINTE 0/	H of PEOSIT	10.2/3			× 1.15
	BOND		1%			x 1.01
	ESCALATIO		13%			× 1.13
	CONTINGE	WC4	15%			1.15
				÷,		
	50.	n - Tomal				7.
	To	F42 Several 12 minus				22,017,000
	To-	<u> </u>		·,		
					ORIGINAL	PAGE 18
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GI	ROUND SUPPORT KSC PRELIMINARY COST I			<u></u>	CONSTRUCTION
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PROJECT	RB INTEGRATION STUDY				
					CODE
		ESTIMATOR			
· ·	T/ENGINEEA	3 1		FROVED BY	
DRAWING	NO. CHECKED BY		AP		
TEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	LAUMEN SUPPORT				<u> </u>
	EQUIPMENT				
	FABRICATION -			<u> </u>	
	HOLD DORIN MECH.	8	E, A	100 4	800,000
	LIET- OFF UMBILICAL	2	E4	3100	6,200,000
	(402)				
	RP-I UNBILICAL	2	EA	350	700,000
<u>.                                    </u>				<u>                                     </u>	
	SUB-TOTAL				7,700,000
	(to sheet 2)				
	DAVIS - BACOH -				
	ENGINE SERVICE	3	E4	4/30 4	1,290,000
	PLATEORM				
	TONI REMOVE /INSTALL	2	EA	Bo K	160,000
	HOM INSTALL.	8	E4	5 2	40,000
• - 725 - 74	LOD UMB. INSTALL.	2	EA	40 4	80,000
	AP-1 UNA INSTALL	2	EA	40 4	80,000
	And the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second o	1.25 July 1.5 1			1.650,000
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	(TO SHEET 2)	Arte Tari	3		
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NO.	PCH	OATE PREPARE			5 D of 3 Z
PROJECT	3 INTEGRATION STUDY				
LOCATION					CODE
	T/ENGINEER	ESTIMATOR .			
DRAWING P	CHECKED BY			PROVED BY	
		ESTIMATED		UNIT PRICE	ESTIMATED AMOU
ITEM NO.	DESCRIPTION	QUANTITY	UNIT	& LABOR	ESTIMATED AMO
	EQUIPMENT		,		
	240,110,000				
	FABRICATION -				
	LRB MECHANICAL	/	LOT		5,379,00
	LRB ELECTRICAL	1	LOT		3, 337,00
	JUB- TOTAL				8,716,00
	(TO SHEET 3)		<u> </u>		
	DAVIS - BACOH -				2,102,00
	ORB ET MECHANICA		107		2,012,00
	ORB / ET ELECTRICA	<i>L</i> /	LOT	-	1,361,00
	LAB ELECTRICAL	1	LOT		375,0
-	25.0				
	SUB-TOTAL				5, 853,00
	(TO SHEET 3)	)			
·					
			100		
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☐ GF	ROUND SUPPORT KSC PRELIMINARY CO	ST ESTIMATE WO	RK SHEET		CONSTRUCTION
NO.	QUIPMENT PCH	DATE PREPAR	ED	SHEET	6 D of 8 D
		9-19	7 - FF		
ROJECT	AB INTEGRATION STU	D4			
					CODE
·	RB MLP 5 - ALL L	ESTIMATOR			
ARCHITEC	T/ENGINEER	-	BUR	45	
RAWING I	HO. CHECKED BY	• 1		PROVED BY	
•					
		ESTIMATED		UNIT PRICE MATERIAL	
TEM NO.	DESCRIPTION	QUANTITY	UNIT	& LABOR	ESTIMATED AMOU
	A/E SERVICES		-		
···				·	
	FACILITY -			-	
		_			
	DESIGN \$ 51,863,000				
	× .06 °/	-			
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·	3, 112,000				3,112,00
	Д.		<u> </u>		
	5185 \$51,863,00			`	
_	× 10 %	_	· ·		
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	5,187,000	<u> </u>			5,187,00
	SUB. TOTAL				8,244,00
	LAUNCH SUPPORT				
	EQUIPMENT				
- '	#			<u>                                     </u>	
	DE516~1 13,021,00				
	× 06 /2				
					70
	787 500		<del> </del>		7.7.
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	4				PAGE IS
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NO,	PCN	DATE PREPARI	9- 5-	SHEET	7 D of & D
PROJECT	RB INTEGRATION STUDI	4			
	RB MLP 5- ALL LOS				COOE
ARCHITEC	T/ENGINEER	ESTIMATOR 5,		45	
DRAWING I	CHECKED BY		Al	PPROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED. QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUN
·	A/E SERVICES (COU'T.)				<u> </u>
	LSE SUB-TOTAL		·		2,084,00
		."		<u> </u>	
	GROUND SUPPORT				
-	EQUIPMENT -				
	<u> </u>				
	DESIGN \$ 22,017,000			·	
	× . 06 %				
			-		
	1,321,000				1,321,000
				•. • •	
	51ES \$22,017,000				
	× 10 %				
	2 7-7 702				2,202,00
	2,202,000				
					3,523,00
	GSE SUB-TOTAL				3,723,000
			, ,		
	TOTAL				13, 706,00
	(TO SHEET 1)				
1.64		5 7 S	1.	1 30 1 to 1.2	
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i				<del>-</del>	<u> </u>
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☐ GR	DUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO	RK SHEET		_ CONSTRUCTION
. NO.	PCN	DATE PREPARE	0 02	SHEET	BD of BD
			,		
	73 JUTEGRATION STUDY				CODE
LOCATION	18 MLP + 5 - ALL LOS	IRP-1			
ARCHITECT	/ENGINEER				
DRAWING NO				PROVED BY	
Terror Market					
		ESTIMATED	UMIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOU
ITEM NO.	DESCRIPTION  INITIAL SPARES -	QUANTITY	UNIT	& LABUR	
-	THINK OFFICE				·
	9% OF LSE AND				
	GSE FABRICATION				
	COSTS				
	15€ ₹ 10,007,000				
	× .09 %		•		•
					4
	901,000	-			901,000
	# 1 725 75				
	GSE # 11, 327,000 × .09%				·
	×				
	1,020,000				1,020,0
	TOTAL		<u> </u>		1,921,00
	(TO SHEET !	)			
			<u> </u>		
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G	ROUND SUPPORT KSC PRELIMINARY COST				CONSTRUCTION
	QUIPMENT				
\. NO.	PCN	10-3		SHEET	15 of 28
PROJECT					
27	B THIEGRATION STUDE	1			
					CODE
	TENGINEER	ESTIMATOR			
		· .	BUR	15	
DRAWING	CHECKED BY		AP	PROVED BY	
				UNIT BAICE	
		ESTIMATED QUANTITY	TINU	UNIT PRICE	ESTIMATED AMOU
ITEM NO.	DESCRIPTION	TITINAUP	UNIT	& LABOR	231111121111111111111111111111111111111
	ACCESS TOWERS -	1500		16 2	24.000
	EARTH WORK		6Y	952	-
	FOUNDATIONS	500	EY	3300	165,000
	STRUCTURAL STEEL		TONS		
	MISC STEEL	15	TONS	4100	61,500
-	GRATING	2500	5 E	1700	42,500
	HAND RAIL / KICK PL.	1000	15	450	45,000
<u> 2.</u>	PEDESTALS -	<u> </u>			
	TYPE II (1)	44	TONS	2050	90,200
	THPE <u>V</u> (2)	54	TONS	2050	110,000
	TYPE VI (2)	61.5	TONS	2050	126,074
_3.	MECHALICAL -				
	PIPE & SUPPORTS -				
	HOO (CHILLED				
	POTABLE, FIREX		LOT	51 K	51,000
	SAMITARY	1	1.07	31 K	31,000
	PHEUMATICS	/ / _	LOT	25 2	25,000
	INTERFACE	,	LOT	2014	20,000
	EQUIDITENT -				
	MYAG	F	LOT	124	124,000
1. 111	CHILLET U=0	/	207	4 14	4 500
	FIZEY	, ,	20-	·, •	
	54077, 74		10-	ヺ゚	
	PHECKINTING	1	207	• , •	10,000
		ORIG	INAL PA	ge is	

PROJECT LERB JUTEGRATION STUDY  LOCATION MLP PARKSITE  ARCHITECT/ENGINEER  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRECKED BY  CRE	☐ GR	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO	ORK SHEET		CONSTRUCT
PROJECT  LAR TELTEGRATION STUDY  LOCATION  MLP PARKSITE  ANCHITECT/ENGINEER  CODE  ANCHITECT/ENGINEER  CHECKED BY  APPROVED BY  APPROVED BY  APPROVED BY  ITEM NO.  DESCRIPTION  ESTIMATED QUARTITY  UNIT PRICE BATERIAL ESTIMATED A  LABOR ESTIMATED A  UNIT PRICE BATERIAL ESTIMATED A  LABOR  ESTIMATED A  LABOR  LABOR ESTIMATED A  LABOR  ESTIMATED A  LABOR  LABOR ESTIMATED A  LABOR  LABOR ESTIMATED A  LABOR  LABOR ESTIMATED A  LABOR  LABOR ESTIMATED A  LABOR LABOR ESTIMATED A  LABOR LABOR ESTIMATED A  LABOR LABOR ESTIMATED A  LABOR LABOR ESTIMATED A  LABOR LABOR ESTIMATED A  LABOR LABOR ESTIMATED A  LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABOR LABO						
LOCATION  ALP PARKS TE 2  ARCHITECYENGHEER  DRAWING NO.  CHECKED BY  CHECKED BY  APPROVED BY  APPROVED BY  APPROVED BY  APPROVED BY  APPROVED BY  APPROVED BY  APPROVED BY  APPROVED BY  APPROVED BY  APPROVED BY  APPROVED BY  ITEM NO.  DESCRIPTION  GUANTITY  UNIT PRICE MATERIAL ESTIMATED A  LABOR JOS, O  AMCC  I EA 75 K 75, O  TRANIS FORMICR  I EA 17 K 177, O  TRANIS FORMICR  CONDUIT  LOT HAY  AVA.  CONDUIT  CABLE COMMECTIONS  I LOT HAY  AVA.  COMMIN. DUCT BANK HSO LE 60°2  27,  COMMIN. CABLE  COMMIN. CABLE  COMMIN. LABOR HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  AND JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE  JUBAN HOLE	PROJECT					
MAP PARKSITE 2  ARCHITECT/ENGINEER  DRAYING NO.  CHECKED BY  CHECKED BY  APPROVED BY  ITEM NO.  DESCRIPTION  DESCRIPTION  ESTIMATED QUANTITY  UNIT PRICE  ALABOR  ESTIMATED QUANTITY  UNIT PRICE  ALABOR  ESTIMATED QUANTITY  UNIT PRICE  ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR ALABOR  ESTIMATED ALABOR  ESTIMATED ALABOR ALABOR  ESTIMATED ALABOR ALABOR  ESTIMATED ALABOR ALABOR  ESTIMATED ALABOR ALABOR  ESTIMATED ALABOR ALABOR  ESTIMATED ALABOR ALABOR  ESTIMATED ALABOR ALABOR  ESTIMATED ALABOR ALABOR ALABOR  ESTIMATED ALABOR ALABOR ALABOR  ESTIMATED ALABOR ALABOR ALABOR  ESTIMATED ALABOR ALABOR ALABOR  ESTIMATED ALABOR ALABOR ALABOR ALABOR  ESTIMATED ALABOR ALABOR ALABOR ALABOR  ESTIMATED ALABOR ALABOR ALABOR ALABOR ALABOR  ESTIMATED ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR ALABOR AL						CODE
ARCHITECT/ENGINEER  CHECKED BY  CHECKED BY  APPROVED BY  ITEM NO.  DESCRIPTION  DESCRIPTION  ESTIMATED QUANTITY  UNIT PRICE MATERIAL ALBOR  ESTIMATED QUANTITY  UNIT PRICE MATERIAL ALBOR  FINATED A  JOGK  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JOG, O  JO			A V			•
DRAWING NO.    CHECKED BY   APPROVED BY	ARCHITEC	T/ENGINEER			5	
ITEM NO. DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTION  DESCRIPTI	DRAWING N	CHECKED BY		AP	PROVED BY	
## ELECTRICAL — SMITCHGEAR I EA 105 % 105,0  A1CC					MATERIAL	
SHITCHGEAR  MICC  MICC  MICC  TRANSFORMER  I EA 175 × 75,0  TRANSFORMER  LIGHT FIXTURES  CONDUIT  CABLE   CONNECTORS  WHRE   CONNECTORS  LOT   1			QUANTITY	TINU	& LABOR	ESTIMATED AM
MCC  TRANSFORMER  I EA 175			,	<b>#</b> 4	IDEK	105,00
TRANSFORMER  1 FA 17 17,0  21GHT FIXTURES  50 EA 600 30,0  CONDUIT  1 LOT 42 42,0  CABLE   CONNECTORS 1 LOT 6 6 6,0  WIRE   CONNECTIONS 1 LOT 14 14,0  COMMIN DUCT BANK 450 LE 60 2 27,  COMMIN CABLE 500 LE 25 2 12,  COMMI MANHOLE 1 EA 4 4 4,0  3UB-TOTAL 1,297,4  3UB-CONTRACT PROFIT 10 % × 1.10  PRIME MARK-UP 10 16 % × 1.10  CONTINGEMENT 15 % × 1.02  CONTINGEMENT 15 % × 1.02  CONTINGEMENT 15 % × 1.02			, , ,	,		75,00
LIGHT FIXTURES   50			1.	<del></del>		17,00
CONDUIT  CABLE   CONNECTORS   LOT 6 6 6.0  WIRE   CONNECTIONS   LOT 14 1 14,  CONIM DUCT BANK 450 LE 60 2 27,  COMM. CABLE 500 LE 25 2 12,  COMM. MANHOLE   EA 4 4 4 4,  3UB-TOTAL 1,297, 5  3UB-CONTRACT OIH 15 6 6 1 1.16  PRIME MARK-UP 10 70 10 11.16  BOND 1 10 10 10 10 10 10 10 10 10 10 10 10 1				EA		30,00
CABLE   CONNECTORS   LOT 6 6 6.0  WIRE   CONNECTIONS   LOT 14 14, 14, 14, 14, 14, 14, 14, 14, 14,		•	<del></del>			42,0
WIRE   CONNECTIONS   LOT   14   14   14   14   16   16   16   17   17   18   18   18   18   18   18				LOT	6 K	6,0
CONINI DUCT BANK 450 LE 602 27,  CONINI CABLE 500 LE 252 12,  COMMI NIANHOLE 1 EA 4 4 4,  SUB-TOTAL 1,397,  3UB-CONTRACT OIH 15 %  SUB-CONTRACT PROFIT 10 %  PRIME MARK-UP 10 %  ESCALATION (6 MONTHS) 2,5 %  CONITINGENCY 15 %  CONITINGENCY 15 %  LIGHT 10 16 %  LIGHT 10 16 %  LIGHT 10 16 MONTHS 15 %  LIGHT 10 16 %  LIGHT 10 16 MONTHS 15 %  LIGHT 10 16 %  LIGHT 10 16 MONTHS 15 %  LIGHT 10 16 MONTHS 15 %  LIGHT 10 16 MONTHS 15 %  LIGHT 10 16 MONTHS 15 %  LIGHT 10 16 MONTHS 15 %  LIGHT 10 16 MONTHS 15 %  LIGHT 10 16 MONTHS 15 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 MONTHS 16 %  LIGHT 10 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16 MONTHS 16			,	LOT	14 4	14,0
COMM. CABLE GOO LE 25°2 12.  COMM. MANHOLE 1 EN H' H, C  SUB-TOTAL 1,297, 5  SUB-CONTRACT OIH 15°/6 × 1.15  PRIME MARK-UP 10°/6 × 1.15  BOND 19°6 × 1.00  ESCALATION (L MONTHS) 2.5°% × 1.00  CONTINGENCY 15°% × 1.15			450	LE		27,0
COMMINIANHOLE    EA 4 4 4 4,0   JUB-CONTRACT OF 1,297,4   JUB-CONTRACT OF 16			500	15		12,5
3UB-CONTRACT OIH 15 % × 1.16  SUB-CONTRACT PROFIT 10 % × 1.10  PRIME MARK-UP 10 % × 1.10  BOND 1 % × 1.0  ESCALATION (LIMONTHS) 2.5 % × 1.02  CONTINGENCY 16 % × 1.15			1	EA	N N	4,00
3UB-CONTRACT OIH 15 % × 1.16  SUB-CONTRACT PROFIT 10 % × 1.10  PRIME MARK-UP 10 % × 1.10  BOND 1 % × 1.0  ESCALATION (LIMONTHS) 2.5 % × 1.02  CONTINGENCY 16 % × 1.15						• : .
SUB-CONTRACT PROFIT 10 % × 1.10  PRINTE MARK-UP 10 % × 1.10  BOND 1 % × 1.00  ESCALATION ( L MONTHS) 2.5 % × 1.02  CONTINGENCY 15 % × 1.15		SUB-TOTAL				1, 397, 4
SUB-CONTRACT PROFIT 10 % × 1.10  PRINTE MARK-UP 10 % × 1.10  BOND 1 % × 1.00  ESCALATION ( L MONTHS) 2.5 % × 1.02  CONTINGENCY 15 % × 1.15						
PRIME MARK-UP 10 % × 1.10  BOND 1 % × 1.0  ESCALATION ( L MONTHS) 2.5 % × 1.02  CONTINGENCY 15 % × 1.15			* *			× 1.15
BOND 1 % × 1.0.  ESCALATION ( L MONTHS) 2.5 % × 1.02  CONTINGENCY 15 % × 1.15		SUB - CONTRACT PROFIT				
ESCALATION ( LINDNITHS) 2.5 % × 1.02  CONTINGENCY 15 % × 1.15			10			
CONTINGENCY 15 % × 1.15						· · · · · · · · · · · · · · · · · · ·
		•				
			10 V 21 V 10 V	7.5	. 72	
						2,150,0
		* BASED CH LILP PARKSITE	#3			
*BASED CH LILP PARKSITE #3	1	1-190 ESTUATE	I	i	i	I

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🗆 ဋ	ROUND SUPPORT KSC PRELIMINARY COST QUIPMENT	ESTIMATE WO	RK SHEET	<b>.</b> De la companya de la companya de la companya de la companya de la companya de la companya de la companya de la	Z CONSTRUCTION
NO.	PCN	DATE PREPARE		SHEET	15 OF 155
		9-23	-88		
DIECT	B INTEGRATION STUL	<b>7</b>			
CATIO	LOX SYSTEM TANK PAD	SAORB	, LC	-39,	CODE
	KSC	ESTIMATOR:			
CHITE	TYENGINEER	P.H.W	IASSU	M _	
AWING	NO. CHECKED BY		AP	PROVED BY	
				UNIT PRICE	
	DESCRIPTION	ESTIMATED QUANTITY	UNIT	MATERIAL & LABOR	ESTIMATED AMOUN
M NO.	18" STEEL PILINGS W/				
<i>.</i>	CONCRETE, 300F LG 3/4	96	EA	9,600	921,60
2	PILE CAPS 10'X10'X 3'THE	16	EA	1,200	19,20
3	CUTOFFS	96		20	1,96
4	PREAUGERING	96		10	96
5	TESTING PILE	/	EA	30,000	30,00
6	MOBILIZATION AND				,
	DEMOBILIZATION	/	EA	50000	50,00
	PILING SUBTOTAL				1,023,68
フ	TANK	/	EA	1, 800,000	
8	SUPER INSULATION	/	EA	600,000	
9	CONCRETE PAD FOR TANK	3/5	04	100	31,50
10	CONCRETE FORMWORK	/	LOT	10,000	10,00
					3, 465, 18
	FROM SNEET ZF				10,576,00
•	SUBTOTAL				14041,18
• • •	SUB OVERHEAD	/5	/•		2,106,11
	SUB PROFIT	10	1/0		1,614,7
<del></del>	PRIME MARKUP	10	10	11 111	1,774,2
1.0	BOND		0.1		986.6
- * *	ESCALATION (LYR)	5	0/0	And the property of	31080
	CANTUS ENCY	<del>                                     </del>	3/3		3,000
	SPECIAL CONSTRAIS	25	1.7.3		57705
	Tatal Cost For Old		140	EA4.	829 8000
	TOTAL COST FOR ONE	7-4-	- <u></u>	10/17	1 x 1 3 3 3 2 2

□ §	ROUND SUPPORT	KSC PRELIMINARY COS	T ESTIMATE WO	RK SHEET	· 3.4.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	□ CONSTRUCTION
5		PCN	9-23-		SHEET	2F OF 15F
OJECT		GRATION S		<i>V 0</i>		
CATION	20x 595	TEM, PADS A	ORB, L	e-39	9, K5C	CODE
CHITEC	T/ENGINEER		P. H. U	IJASS	UM	
DNIWA	NO.	CHECKED BY			PROVED BY	
			ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
M NO.		LOX PUMPS	2	EA	150,000	300,000
2		LOX PUMPS	2	EA	260,000	520,000
3		LINE	2000	IF	3400	6,800,000
4		VES, LOX	6	EA	80.000	10
7	_	V VALVESLOX	,	EA	60,000	240,000
6		FILL VALVE	1	EA	12,000	12,000
7		ER FILL VALUE		EA	12,000	60,000
8	INSTRUMEN		/	LOT	880,000	880,000
ا رک		ITATION TUBING		LOT	400,000	400,000
10		Y PRESSURE				
	10" VAPOR	<del></del>	/	EA	28,800	29,00
11	10" VAPO	CIZER VALVE	5 /	EA	80,000	80,00
12	LOX INTE					
	TOWE		/	EA	250,000	250,00
13	VJLINE	SUPPORTS	90	EA	1500	1
14	10"VENT	VALVES		EA	80,000	160,000
15	ACIDE 1	POWER				
	5457	EM		EA	120,000	1
16	LIGHTIN	G SYSTEM		EA	60,000	60,00
17	FIRE DO	ETECTION	·		,	
	5457	EM	/	EA	20,000	20,00
18	LIGHTNIN	G PROTECTION				
	SUSTE	- 149		EA	11 000	
11	TAME W	ENT STACK	/		20,000	<u> </u>
		SUB. TOTAL				10,576,0
_ 7					NAL PAGE	is .
				OF P	OOR QUALI	Y

Ĕ	ROUND SUPPORT KSC PRELIMINARY COST QUIPMENT				☐ CONSTRUCTI
3. NO.	PCN	DATE PREPAR	ED		3 F OF 15
PROJECT		11-5-	88		
	B INTEGRATION STUDY				
LOCATIO	LNZ SYSTEM, LC-39 A OR	B, KS	<b>C</b>		CODE
ARCHITE	CT/ENGINEER	ESTIMATOR.	11100	,, 44	<del>1</del>
DRAWING		~, ,,,,		PROVED BY	
				T	·
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LASOR	ESTIMATED AM
	FROM SHEET HE				\$12,188,
	SUB OVERHEAD	15	1/4		1, 828,
	SUB PROFIT	10	%		1,401,0
	PRIME MARKUP	10	%		1,541,
	BOND		%		169, 3
	ESCALATION (IYE.)	5	%		856
	CANTINGENCY	15	%	· ·	2,697,
- 1	SPECIAL CONDITIONS	25	%		5,170,
			•		
					25,854,
	TOTAL			SAY	\$25,900,
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	ROUND SUPPORT KSC PRELIMINARY CO	OST ESTIMATE W	ORK SHEE	T	CONSTRUCTION
0. NO.	PCN	DATE PREPAR	ED		THE OF 15E
		11-5-	88	3466	
PROJECT LRB	INTEGRATION STUDY				
	LHZ SYSTEM, LC-39 A O.	eB KSC			CODE
ARCHITEC	T/ENGINEER CONTRACTOR STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AND A CONTRACTOR OF THE STATES AN	ESTIMATOS.	412 = -		
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TEM NO.	DESCRIPTION	ESTIMATED		UNIT PRICE	
/,		YTITHAUD	UNIT	& LABOR	ESTIMATED AMOUNT
20.00	TANK FOUNDATION  (REF. LOX ESTIMATE)			/ / / / / / / / / / / / / / / / / / / /	1112100
2	THUM - 900,000 GAL.			1,023,680	1,023,680
<u> </u>	(REE LOX ESTIMATE)		EA	2,441,500	2, 441, 500
3.	LHZ VAPORIZER	1	EA	29,000	
4.	FLARE STACK (230')	,	EA	800,000	
5.	LHZ VALVES - 10"	10	EA	150,000	1, 500,000
6.	LHZ VALVES - b"	7	EA	60,000	420,000
7.	10" VJ PIPE	200	LE	3,400	
8.	6" VJ PIPE	200	1 =	2,040	408,000
9.	PIPE SUPPORTS	22	EA	1,500	33,000
10.	THUKER MANIFOLD VALVE			7,0	03/03
	(G PORT)	. 6	EA	30,000	180,000
11.	VEUT PIPE - 6" 5.5T.		25	1,020	1,428,000
	INSULATED				
12	PHEUMATICSÉ				
. j =	INSTRUMENTATION		207	1,625,000	1,625,000
13.	AC DC POILER		EA	120,000	
14.	LIGHTING SYSTEM		EA	. 160,000	160,000
15.	FIRE DETECTION		EA	20,000	20,000
16.	HGDS		EA	870,000	870,000
17.	DELUGE SYSTEM	/	EA .	450,000	450,000
	はいち・ブラブ以上				12,132,173
		·		ORIGINAL F	AGE IS
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	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO		ET Januaria et Maria (Januaria)	☐ CONSTRUCTION
7. NO.	PCN C	9-27	ED	SHEE	5F OF 15F
PROJECT LR	B INTEGRATION ST	UDY			
LOCATIO	PP-1 SERVICING SYST.	EM, F	405	AORB	CODE
ARCHITE	CT/ENGINEER	ESTIMATOR		953UM	
DRAWING	CHECKED BY			APPROVED ST	•
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	MATERIAL & LABOR	ESTIMATED AMOUNT
	FROM SHEET BE				3 076 700
	SUB OVERHEAD	15	%		461,505
	SUB PROFIT	10	%	·	353,821
	PRIME MARKUP	10	%		389,203
	BOND	1	%		42,812
	ESCALATION (1 YR.)	5	%		216,202
-	PONTINGENCY	15	%		681,036
	SPECIAL CONDITIONS	25	%		1,305,320
			-		6,526,599
	TOTAL COST FOR ON	E (1)	PAD	SAY	\$6,600,000
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				4 ( Feb. 17 ( ) 4 ( ) 1	
					DIGINIAL PAGE 15
					RIGINAL PAGE IS F POOR QUALITY

ARCHITECT/ENGINEER  PCN  DATE PREPARED  9-27-88  SHEET <u>BF</u> OF <u>ISF</u> OF <u>ISF</u> OF ACCED BY  DATE PREPARED  9-27-88  SHEET <u>BF</u> OF <u>ISF</u> OF <u>ISF</u> OF ACCED BY  SHEET <u>BF</u> OCCED BY  SHEET <u>BF</u> OCCED BY  OCCED BY  SHEET <u>BF</u> OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY  OCCED BY		ROUND SUPPORT KSC PRELIMINARY COST I		<u> </u>		☐ CONSTRUCTION
COLATION & P.   SERVICING SYSTEM PADS AOR B,  INCLUTER SYNCHING SYSTEM PADS AOR B,  INCLUTER SYNCHING SYSTEM PADS AOR B,  INCLUTER SYNCHING SYSTEM PADS AOR B,  INCLUTER SYNCHION	<u>:</u>		•		SHEET_	6F OF 15F
COLATION & P.   SERVICING SYSTEM PADS AOR B,  INCLUTER SYNCHING SYSTEM PADS AOR B,  INCLUTER SYNCHING SYSTEM PADS AOR B,  INCLUTER SYNCHING SYSTEM PADS AOR B,  INCLUTER SYNCHION	LR	B INTEGRATION ST	TUDY			CODE
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TEN NO.   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESC	DRAWING	NO. CHECKED BY	<u></u>	AP	PROVED BY	
TEN NO.   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESCRIPTION   DESC					10012 00162 T	
3000 GPM RP-1 PAMP	ITEM NO.	DESCRIPTION		UNIT	MATERIAL	ESTIMATED AMOU
2 1000 GPH RP-1 PUMP  3 30 GPM RP-1 DRAIN PUMP  4 RP-1 STORAGE TANK  5 P" SCHEDULE 40 FILL 6  DRAIN LINE 3/6 S ST 1600 LE 100 160,0  6 6" SCHEDULE 40 VENT  PIPE 3/6 S ST 1750 LF 60 105,0  7 8" WELD FITTINGS  3/6 S ST 20 EA 700 140  8 6" WELD FITTINGS  3/6 S ST 25 EA 400 10,0  9 VENT STACE 1 EA 30,000 30,0  10 MATALYTIC CAMBUSTION  CHAMBER 1 EA 9,000 114  12 6" VALVES 1 EA 9,000 125,  13 PNEUMATIC SYSTEM 1 EA 180,000 125,  14 ONTROL CANSOLE 1 EA 25,000 125,  15 RP-1 SERVICE TOWER 1 EA 25,000 60  17 PIPE TIPLE 100 EA 100 EA 100 60  17 PIPE TIPLE 100 EA 100 EA 100 60  17 PIPE TIPLE 100 EA 100 EA 100 60  17 PIPE TIPLE 100 EA 100 EA 100 60  17 PIPE TIPLE 100 EA 100 EA 100 60  17 PIPE TIPLE 100 EA 100 EA 100 60  18 PIPE TIPLE 100 EA 100 EA 100 60  19 PIPE TIPLE 100 EA 100 EA 100 60  10 PIPE TIPLE 100 EA 100 EA 100 60  10 PIPE TIPLE 100 EA 100 EA 100 60  10 PIPE TIPLE 100 EA 100 EA 100 60  10 PIPE TIPLE 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 100 EA 10	/	2000 GPH RP-1 PUMP	2		200,000	
3 30GPM PP-IDRAIN PUMP   EA 10,000   10,00  4 RP-I STORAGE TANK   3 EA 291,500   974,50  5 P" SCHEDULE 40 FILL &	2		/	EA		
# RP-1 STORAGE TANK  \$ 8" SCHEDULE 40 FILL \$	3		/	EA		
DRAIN LINE 316 S ST 1600 LE 100 160,0  6 6" SCHEDWE 40 VENT	4		3	EA	291,500	874,50
6 6 "SCHEDWE 40 VENT	<b>6</b> 5		·			
PIPE 316 S ST 1750 LF 60 1050  7 8"WELD FITTINGS  8 6"WELD FITTINGS  316 S ST 20 EA 700 140  9 VENT STACK 1 EA 30,000 30,0  10 ATALYTIC CAMBUSTION		DRAIN LINE 3165 ST	1600	LE	100	160,0
7 8"WELD FITTINGS  3/6 S ST  20 EA 700 14,0  8 6"WELD FITTINGS  3/6 S ST  25 EA 400 10,0  9 VENT STACE 1 EA 30,000 30,0  10 CATALYTIC COMBUSTION  CHAMBER 1 EA 9,000 90,0  1/1 8" VALVES 12 EA 9,500 1/4  12 6"VALVES 4 EA 6,000 24,  13 PNEUMATIC SYSTEM 1 EA 120,000 120,  14 CANTROL CANSOLE 1 EA 10000 60  15 RP-1 SERVICE TOWER 1 EA 250,000 60  16 8" FLEXIBLE MOSE 1 EA 8,000 80,000  17 P.P. TIPLOTE 100 EA 1,12  20 FILTERTICI SEPTIME 1	6	6" SCHEDULE 40 VENT				1050
3/6 S ST 20 EA 700 14,0  8 6" WELD FITTINGS ————————————————————————————————————		PIPE 316 SST	1750	LF	60	105,0
8 6" WELD FITTINGS  316 S ST  9 VENT STACK 1 EA 30,000 30,0  10 NATALYTIC COMBUSTION  CHAMBER 1 EA 9,500 114  12 6" VALVES 12 EA 9,500 114  13 PNEUMOTIC SYSTEM 1 EA 120,000 120,  14 CONTROL CONSOLE 15 RP-1 SERVICE TOWER 1 EA 8,000 80  17 6" FLEXIBLE HOSE 1 EA 8,000 80  17 18 PLEXIBLE HOSE 1 EA 8,000 80  17 PRESCRIPTIONS SOUTH 1 EA 100 000 60  18 PRESCRIPTIONS SOUTH 1 EA 100 000 60  18 PRESCRIPTIONS SOUTH 1 EA 100 000 60  19 PRESCRIPTIONS SOUTH 1 EA 100 000 60  10 FILTER TICK SEPT. 1 = 1 = 12  21 FIRE SINGLE SYSTEM 1 EA 100 000 000 000 000 000 000 000 000 00	7	8"WELD FITTINGS	0.		740	11/1
316 S ST 25 EA 400 10,0  9 VENT STACK 1 EA 30,000 30,0  10 NATALYTIC CAMBUSTION		316 S ST	20	EA	700	14,0
9 VENT STACK   EA 30,000 30,0  10 NATALYTIC COMBUSTION - 90,000 90,000  (CHAMBER   EA 95,000 114  12 6"VALVES   EA 9,500 114  13 PNEUMATIC SYSTEM   EA 10,000 120,  14 CONTROL COMSOLE   EA 1,0000 60  15 RP-1 SERVICE TOWER   EA 250,000 60  16 8" FLEXIBLE HOSE   EA 8,000 80  17 NESTIBLE MOSE   EA 8,000 60  18 P.P. TIPLOTE   100 EA 1,100  MONITARINAL PAGE 18  21 FIFE YEART SYSTEM   EA 1000 PROBRIGINAL PAGE 18  22 ACIOC POWER SYSTEM   EA 1000 PROBRIGINAL PAGE 18	8				1/11	10 1
10 CATALYTIC COMBUSTION  CHAMBER  1 EA 90,000 90,  11 8" VALVES  12 EA 9,500 114  12 6" VALVES  13 PNEUMATIC SYSTEM  1 EA 120,000 120,  14 CONTROL COMSOLE  15 RP-1 SERVICE TOWER  1 EA 8000 800  15 RP-1 SERVICE HOSE  1 EA 8000 800  17 6" FLEXIBLE HOSE  1 EA 8000 60  17 PRE TIFFORT  20 FILTERTICH SEPTIFF 2 1 = 9  21 - 17 - 10 = 9  21 - 17 - 10 = 9  21 - 17 - 10 = 9  21 - 17 - 10 = 9  21 - 17 - 10 = 9  21 - 17 - 10 = 9  21 - 17 - 10 = 9  21 - 17 - 10 = 9  22 AC 10 C POWER SYSTEM  1 = A 10 @ POR OR QUALITY			25	EA	<del> </del>	
CHAMBER  11 8" VALVES  12 EA 9,500  11 14  12 6" VALVES  13 PNEUMATIC SYSTEM  14 CONTROL CONSOLE  15 RP-1 SERVICE TOWER  16 8" FLEXIBLE HOSE  17 6" FLEXIBLE HOSE  18 PRESIDENTE TOWER  18 PRESIDENTE TOWER  19 PRESIDENTE TOWER  100 EA  110 FRESIDENTE  100 EA  111 FRESIDENTE  111 FRESIDENTE  112 FILTERTICH SERVICE  113 FORESTER  114 GROOD  115 PRESIDENTE  115 FORESTER  116 FILTERTICH SERVICE  117 ORIGINAL PAGE IS  118 FILTERTICH SERVICE  119 ORIGINAL PAGE IS  120 PRESIDENTE  121 FRESIDENTE  122 PC 100 PROVER SUSTEM  1 = A 100 PRO ORIGINAL PAGE IS	9		/	EA	30,000	30,0
	10		/	=1	90,000	90
12 6" PALVES 4 EA 6,000 24  13 PNEUMATIC SYSTEM 1 EA 120,000 120,  14 CONTROL CONSOLE 1 EA 250,000 60  15 RP-1 SERVICE TOWER 1 EA 8000 800  16 8" FLEXIBLE HOSE 1 EA 8,000 60  17 PIRE TIPHOTE 100 EA 112  20 FILTERTION SERVICE 2 1 EA 100 EA 112  21 FIRE TIPHOTE 1 1 EA 100 EA 112  22 AC 10C POWER SYSTEM 1 EA 100 EA 000 EB  22 AC 10C POWER SYSTEM 1 EA 100 EB QUALITY			1		<del></del>	
13   PNEUMATIC SYSTEM   EA 120,000   120,   14   CONTROL CONSOLE   EA 6,000   60   15   RP-1 SERVICE TOWER   EA 8,000   80,   16   8"   FLEXIBLE HOSE   EA 6,000   60   17   CONTROL SERVICE TOWER   6 = F (17)   18   P.P. SIREMAN   18   600LESE   6 = F (17)   19   FLEXIBLE HOSE   6 = F (17)   10   EA 6,000   60   11   P.P. SIREMAN   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PORDE QUALITY   1 = A 100PO			12			
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PROJECT		<u> </u>		** * * * **		
LRI	S INTEGRAT	TION ST	UDY			CODE
LOCATION	FLAME DEFLI	ECTORS,	PADS A	ORE	3	CODE
LC-	39 KSC		ESTIMATOR			
ARCHITE	1/Elduren		R. H.	WAS	SUM	
DRAWING	NO.	CHECKED BY			PROVED BY	
TEM NO.	DESCRIPTIO		ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
IEM NO.	MAIN DEFLEC					
	STRUCTURAL S		1947.5	TON	\$3039	\$4.095.053
1	FONDU FYRE	PERDAMBU			900	312,840
2	METAL MESHA	PEINENBOIN	49000	5/=	2	98,000
	MELAL PIESAN	- CINTON CONTROL	7	-		
<del></del>	SIDE DEFLE	CTORE	(FA)			
	C-AULTICAN	STEE!	275.0	TON	3039	835.72.
4	STRUCTURAL FONDU FIRE R				900	74.25
7			3000	SF	2	6,000
6	METAL MESH REI	NEURCING	5000			·
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. 17	MAIN DEFLECT		1	EA		900,000
g	SIDE DEFLEC		2	EA	300,000	600,00
	SINE DEFELC	, ,,,,			*	6,921,862
	SUB OVERHERD	)	15	0/0		1.038,280
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	PRIME MARK		10	0/0		87561
. :	BOND		1	0/0		96.31
	ESCALATION	(IYE)	5	%		486.40
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DRAWING	NG. CHECKED #Y				
ITEM NO.	DESCRIPTION	ESTMATED QUANTITY	UNIT	UNIT PRICE MATERIAL ,& LABOR	ESTIMATED AMO
	ARCH. STRUCTURAL				8401,04
2	MECHANISMS				250, 160
3	MECHANICAL				177, 15.
4	ELECTRICAL				18 45
			-		846.8
	SUBOVERHEAD	15	0/0		127.00
	SUB PROFIT	10	0/0		97.3
	PRIME MARKUP	. 10	%		107, 16
	BOND	/	%	•	11, 78
	ESCALATION (IYR.)	5	%		59.50
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	SPECIAL CONDITIONS	25	%	·	359, 2
					1,796,
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LOCATION	GOX VENT	ARM(FABRIC	ATION), L	C-39	PAD	COOE
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	SUB PROF		10	%		169, 3
	PRIME M		10	%		186,23
	BOND			%		20,40
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1. NO.	PCH	DATE PREPARE	O	SHEET	10 F or 15
PROJECT	B INTEGRATION STUD	Υ'			
LOCATION	GOX VENT ARM FABRICATIO	ON), LC-	39, P	DAGE	CODE
	T/ENGINEER	ESTIMATOR P. H. U	V4550	2M	
DRAWING	NO. CHECKED BY		AP	PROVED BY	
ITEM HO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMO
	GOX VENT ARM				
	FORWARD ARM SEGMENT				\$
	EQUIP. & ASSEMBLY	/	EA	1,040,000	1,0400
2.	FORWARD ARM SEGMENT				
	STRUCTURAL - TYPE TI	18	TON	33.39	60,1
3.	HINGE PIN ASSEMBLY		EA_	125,000	125,0
4.	AFT ARM SEGMENT	1 1		4 - 4 -	0.8
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5,	HINGE SUPPORT STRUC-				
	TURE A 36	40	TON	3039	121,
6.	LATCH BACK SUPPORT			0 1 00	115
	STRUCTURE A36	15	TON	3039	45,
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	SUB-TOTAL				1,472,38
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1.	LRB FORWARD				·
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ч.	ORBITER WEATHER				
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DRAWING !	NO. CHECKED BY		AP	PROVED BY	
··				UNIT PRICE	•
ITEM NO.	DESCRIPTION	ESTIMATED	UNIT	MATERIAL & LABOR	ESTIMATED AMO
1.	LRB FORWARD				
	ACCESS -				
	COLUMNS	49.6	TONS	3300	163,68
	BEAMS	148.8	TONS	3300	491.04
	DIAGONALS	40.9	TONS	3300	134,97
	41130.	10.0	TONS	4100	41,00
	GRATING	3200	32	1700	54,40
	STAIRS	2	EA	20 K	40,00
-	HALID RAIL / KICK PL.	480	- 45	450	21,60
		-			
	JUB- TOTAL				946,6
	SUB OVERHEAD	15	%		× 1.15
	SUB PROFIT	10	%		x 1.10
	PRIME MARKUP	10	1/0		× 1,10
	BOUD		%		x 1.0
1.4	ESCALATION (I YEAR)	5	%		× 1.04
	CONTINGENCY	15	%		4 1.15
	SPECIAL CONDITIONS	25	%		× 1.25
·		· · · ·			
200 (34	TOTAL				2.009.0
					:
		·	1		
			OR	GINAL PAG	E IS

Ē	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE W	ORK SHEE	<b>T</b>	CONSTRUCTION
0. HO.	PCI CONTRACTOR OF THE PCI	DATE PREPAR	7-88	SHEET	13E OF 15E
PROJECT					
	INTEGRATION STUDY		<u> Maringa</u>		Tana
LOCATION	79 PAD AOAB - PRESSU	RE 54	ISTENI	5 (446)	CODE
	T/ENGINEER	ESTIMATOR			
		5.		<b>4</b>	
DRAWING N	LIUM			PPROVED BY	
		T	<del>                                     </del>	UNIT PRICE	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	TINU	MATERIAL & LABOR	ESTIMATED AMOUN
/	1/2" x . 072 TUBING	400	2,=	1500	6,000
	6000 PSIG				
2.	FITTINGS 1/2"	/	LOT	1000	1,000
3.	3/4" x 035 TUBING	.50	15	1500	750
	6000 PS1G			,	
4.	EITTINGS 3/4"	/	LOT	200	700
5.	FLEX HOSES	3	EA	1000	3,000
6.	SUPPORTS	200	EA	2000	4,000
7.	TAP-IN TO EXISTING	40	HR	3200	1, 280
	6000 PSIG LINE				
8.	REGULATOR PAWEL	2	EA	90 ×	180,000
9.	CLEANING	1	205	1000	1,000
10.	HYDROSTAT TESTING	1.	207	1000	1,000
11.	LEAK TESTING	,	LOT	500	500
12:	PAINT	450	15	200	900
13.	INSTRUMENTATION	1	107	5000	5,000
14.	HIGH PRESSURE	10	EA	100×	1,000,000
	STORAGE BOTTLES				
15.	MANIFOLD	1000	EA	איסו	10,000
	SUB-TOTAL				1.214,63
	SUB OVERHEAD	15	%		× 1.15
	SUB PROFIT	10	%		¥ 1.10
	PRINTE NIARY-UP	10	10		× 1.10
	2 12	/	# 1 gr		٠ ( م ١٠ - ١٠ - ١٠ - ١٠ - ١٠ - ١٠ - ١٠ - ١٠
		-57			. 2.26
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☐ GF	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE W	ORK SHEET	<b>r</b>	CONSTRUCTIO
7. NO.:		DATE PREPAR	ED 7 - 88	SHEE	1 14 % OF 15 K
PROJECT					
LOCATION	B INTEGRATION STUD				<b>√</b> coo∉
16-		E 345	TEMS	[GDCC	P
ARCHITEC	T/ENGINEER:	ESTIMATION	3024	\$	
DRAWING N	GHECKED BY			PROVED BY	
TR	DYME			T	<del></del>
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	MATERIAL & LABOR	ESTIMATED AMOU
1.	1/2" x . 072 TUBING	700	2.2	15.00	10,500
	6000 PS16				
2.	FITTINGS 1/2"	,	LOT	2000	2,000
3.	3/4" x . 035 TUBING	50	2 =	1500	750
	6000 PS14			,	
4.	FITTINGS 3/4"	. /	LOT	200	200
5.	FLEX HOSES	5	EA	1000	5,000
6.	SUPPORTS	350	EA	2000	7,000
7.	REGULATOR PAWEL	2	EA	90 4	180,000
8.	MANIFOLD	2	<b>E</b> A	104	20,000
9.	INSTRUMENTATION	1	LOT	10 K	10,000
10.	CLEANING	/	LOT	2000	2,000
11.	HYDROSTAT TESTING	,	LOT	2000	2,000
12.	LEAK TESTING	/	LOT	1000	1,000
13.	PAINT	450	LF	200	1,500
	SUB-TOTAL				241,950
	SUB OVERHEAD	.15	%		× 1.15
·	SUB PROFIT	10	%		x 1.10
	PRIME MARK-UP	10	%		× 1.10
10.7 1 1 1	BOND	1	%		1.21
	ESCALATION (I YEAR)	5	%		× 1.05
	JOHN - 12 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2 1 5 2	1-5	0 + 2 m		
	<u> </u>	21.55	·'		× 1.55
-+	. 75TAL				514,000
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0. NO.	ROUND SUPPORT KSC PRELIMINARY COST		•		
	P.C.I	DATE PREPAR	, , ,	SHEET	156 OF 151
PROJECT					•
LA	B INTEGRATION STUDY				I COD€
LOCATION	39 PAD A OF B - TTV				
	T/ENGINEER	ESTIMATOR		\$	
DRAWING I				PPROVED BY	
		ESTIMATED		UNIT PRICE	ESTIMATED AMOU
ITEM NO.	DESCRIPTION TO THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF T	QUANTITY	UNIT	& LABOR	ESTIMATED AMOU
	AUD VERIFICATION (TTV)				
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	MAMPOWER 70				
	MHRS IVEAR × 7000			1	
	<u> </u>				
	DURATION x . 583				
	81,667	81667	HR	# 3500	2.858.34
					-
	ESCALATION (TO MID	1.45	%		x 1.014/4
	POINT & 5%)				
	CONTINGENCY	. 15	%	·	× 1.15
	SPECIAL CONDITIONS	25	%		× 1.25
	5/ES	10	%		× 1.10
	TOTAL		e de la companya de la companya de la companya de la companya de la companya de la companya de la companya de		4,585,00
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☐ GR	OUND SUPPORT	KSC PREL	IMINARY COST	ESTIMATE WO	RK SHEET	_	CONSTRUCTION
. NO.	UIPMENT	C <b>W</b>		DATE PREPARE	D		29 of 29
PROJECT	73 ILTEGE	ATION	STUDE	1			
LOCATION	the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s						COOE
ARCHITEC	T/ENGINEER			ESTIMATOR .	BURN	15	
DRAWING N	10.	CHE	CKED BY		AP	PROVED BY	
ITEM NO.	DE	SCRIPTION		ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	OPERATING		TEL1				
-	SOFTWARE				·		
	· 1 MANI		PER		•		
	10 LINE						
	. 900,000						
	CODE TO	•		90,000	MHR.	\$ 5000	4,500,00
						·	
2	APPLICATIO	44 50	ETWARE	-			
	· I MANIE				•		
	10 114						
	. 950,000						
	CODE TO			95,000	MHR.	\$500	4,750,000
	7,000				•		
		-5UB-	TOTAL				9,250,000
	PRILIE 0/1	I d PZO	سرريح	10%			x 1.10
	ESCALATION			5%			× 1.05
	CONTINGER	104		15%			x 1.15
			, N. T.	0.			
•		Tor	A	•			12, 257,50
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-						ORIGINAL	PAGE IS
						OF POOR	

). NO.	PCN	DATE PREPAR	eo o - 88	SHEET	1 <u> </u>
PROJECT	THE GRATION STUDY				
OCATION			217104	15	CODE
		ESTIMATOR	BURN		
DRAWING	NO. CHECKED BY			PROVED BY	•
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	SULJABU/				
			Į.		
	INSTALLATION & LETE				2,760,000
	CERTIFICATION TESTING				4,840,000
	LSE REFURB / REMOVE / SH	1,10			1,520,000
	FACILITY MODIFICATIONS				525,000
			·		
	SUB - TOTAL				9,645,000
				·	
	LETE INTEGRATION / FAC	60%			5,787,000
	MAINTENANCE / DOCUMENT	47,04			
·		•			
	SUB- TOTAL				15,432,000
	ESCALATION (2 YEARS)	10.25%			× 1.1025
	CONTINGENCY	15%			× 1.15
	ACTIVATION MIGHT.	15%			. 1.15
		21.			
	TOTAL				22,500,000
			r can e		
				ORIGINAL P	AGE 18
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D SUPPORT	KSC PRELIMINARY COST	ESTIMATE WO	RK SHEET	)	CONSTRUCTION
AENT PC	N CONTRACTOR	DATE PREPARE	D		24 64
		9-30	-88	SHEET	2 H of <u>b H</u>
INTEGR	ATION STUDY				
	LSE ALL CO		ATION	13	CODE
INCER		ESTIMATOR 2		•	
	CHECKED BY		AP	PROVED BY	
		ESTIMATED		UNIT PRICE	ESTIMATED AMOUNT
DES	CRIPTION	QUANTITY	UNIT	& LABOR	23,111111111111111111111111111111111111
	- 1				
	ON & LETE -	- 2	EA	220 K	440,000
	SERVICE MAST		EA	220	440,000
	SERVICE MAST		EA	10 K	160,000
	IN MECHALISM	2	EA	340 K	680,000
•	ENT ARM	4	EA	220 ×	880,000
• -	UNBILICAL ST UMBILICAL	4	e A	404	160,000
-WK / /W	J. UMINICIONE			,-	
	- 12 T-TA:	<del>                                     </del>			2,760,000
	SUB-TOTAL (TO SHEET 1)			·	
BTIEIL AT	ION TESTING -				
	SERVICE MAST	2	EA	450 %	900,000
	SEZVICE MAST	2	EA	480 K	960,000
	W MECHANISM	16	EA	20	320,000
	NT ARM	2	EA	310 %	620,000
•	UMBILICAL	4	EA	450 4	1,800,000
WIR / INS	UNGBILICAL	4	EA	600	240,000
	and the state of the state of				
	SUB-TOTAL				4,840,000
Marie Berger	(70 SHEET 1)				
•	Charles and the second			1.19/6/6	
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			-		ORIGINAL PAGE
		1	1		OF POOR QUALITY

ြင့	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO	RK SHEET	□ مراجع درجون	☐ CONSTRUCTION
NO.	QUIPMENT	DATE PREPARE	:0 - 88	SHEET	34 of 6H
ROJECT	RB THEGRATION STUD	4			
		CONFIC	URA.	rions	CODE
	T/ENGINEER	ESTIMATOR 5. /	BURN	PROVED BY	
RAWING	NO.			UNIT PRICE	
IEM HO.	DESCRIPTION	ESTIMATED QUANTITY	TINU	MATERIAL & LABOR	ESTIMATED AMOUNT
	REFURBISH-JEHT / LSE		· · ·		
	MAINTENANCE / REMOVAL				
	SHIPMENT -		·		
	LOS TAIL SERVICE MAST	2	EA	135 4	270,000
	LHZ THIL SERVICE MAST	2	EA	135 4	270,000
	HOLD DOWN MECHANISM	16.	EA	54	80,000
	ET HZ VENT ARM	2	EA	1604	320,000
	LOS TO UMBILICAL	4	EA	135 K	540,000
	PLIR / INST UMBILICAL	4	EA	שטו	40,000
	SUB. TOTAL				1,520,000
<del></del> -	SUB-TOTAL (TO SHEAT 1)				
	FACILITY MODIFICATIONS.	1	111		
. ,	UMBILICAL INTERFACE	l l	E.4	350 ×	360,000
	SIMULATOR				
	HOLD DOWN LIECID.	,	EA	175 K	175,000
<del>-</del>					
	TEST EIXTURE		.,		
	SUB-TOTAL				525,000
	(TO SHEET )				
				GINAL PAC	. •
			OF	POOR QUA:	\$* <b>Y</b>

	ROUND SUPPORT KSC PRELIMINARY COST QUIPMENT		☐ CONSTRUCTI		
. NO.	PCN	DATE PREPARI			4H OF 6
PROJECT	B INTEGRATION STUDY				
LOCATIO			,	•	CODE
	CT/ENGINEER	ESTIMATOR			
DRAWING	NO. CHECKED BY	ر بخد		PROVED BY	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMO
11.5	ALL LOZ /RP-1				
	CONFIGURATIONS -				
	DELTA COSTS MUST B	E		,	
· · · · · ·	ADDED TO SUMMARY	T			
	SHOWN ON SHEET 1				
	INSTALLATION & LETE -				
	RP-1 UMBILICAL	2	EA	40 4	80,000
	-	•			
	CERTICICATION TESTING -	:			
	RP-1 UMBILICAL	3	EA	604	120,000
-	REFURB / MAINTENANCE /				
· <del>-</del> 1	REMOVE / SHIP-				
* * *	AP-1 UNBILICAL	2	EA	15 2	30,000
	SUB- TOTAL				230,000
	INTEGRATION / FACILITY	60	%		138,00
	MAINT. / DOCUMENTATION				
· · · · ·		- 1 v			
	SUB- TOTAL			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	368,00
	ESTALATION (S NEAP )	10.25			1.1.72
	January Company	15			2 1. 15
	1,	15	5/0		× 1.15
	LOTIVATION LIGHTI				<del></del> -
	TOTAL				537,00

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		DATE PREPARE	0 - 88	SHEET	5H of 6M
OJECT	RB INTEGRATION STUE				
CATION					CODE
	ETE - ADDITIONAL 15E		40	55	
	T/ENGINEER	ESTIMATOR	BUR	<b>√</b> ≤	
RAWING	NO. CHECKED BY			PROVED BY	
				· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·
EM HO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUN
•	LOZ /LHZ PUMP FED				
	CONFIGURATION -				
	DELTA COSTS LIUST		•		
	BE ADDED TO SUMIN	ARL			
	TOTAL SHOWN ON SI	EET	4		
	4		, .		
	INSTALLATION & LETE -				
	ET GOX VENT ARM	2	EA	2304	460,00
	LH2 T.D UMBILICAL	4/	EA	220 ×	880 00
		/			
·					
	CERTIFICATION TESTING -				
	ET GOX YELLT ARM	2	EA	240 %	480,00
	LHO TO UNTBILICAL	4/	EA	480 K	1,920,00
	REFURB / MAINTENANCE /				
	RELIOVE / SHIP -				
	ET GOX VENT ARM	2	EA	190 ×	380,00
	LHO TO WHEILICAL	4	EA		540,00
	The state of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second				
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. NO.	QUIPMENT PCH	DATE PREPARE			bH of 5	
•		9-3	0-58	SHEET		
PROJECT	المن ويشيق المستعلق المن المن والمستعدد والمستعدد المستعدد المستعدد المستعدد المستعدد المستعدد المستعدد المستعدد					
	B INTEGRATION STUDY				CODE	
<b>L</b> A	TE - ADDITIONAL LSE	LOZ /LH	2 60	55		
ARCHITEC	ST/ENGINEEN	ESTIMATOR		· · · · · · · · · · · · · · · · · · ·		
		-5. 7	O U PA	PROVED BY		
DRAWING	NO. CHECKED BY					
			<del></del>	UNIT PRICE		
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	MATERIAL & LABOR	ESTIMATED AMO	
	10 = /142 SUB - TOTAL				4,660,0	
· -	INTEGRATION / EAGILITY	60%			2,796,0	
	MAINT.   DOCUMENTATION					
	SUB- TOTAL				7,456,0	
<u> </u>	2012-10172					
	ESCALATION (2 VEARS)	10.25%	, ,		× 1.1025	
	CONTINGENCY	15%		.,	× 1.15	
	ACTIVATION MGNIT.	15%	,		× 1.15	
	Mellianing - In-li		<del></del>			
	LOZ/LHZ TOTAL				10.872,0	
	202/678					
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	ROUND SUPPORT KSC PRELIMINARY COST	ESTIMATE WO	ORK SHEE	r Doğumlar	☐ CONSTRUCTION
NO.		DATE PREPAR		SHEET	1 I of 6 I
		10-6	-88	J	
PROJECT	B INTEGRATION STU	DY			
	"HIGH VOLTAGE DIST!		-10N	<del>,</del>	CODE
	CT/ENGINEER	ESTIMATOR			
		R.H.	WAS.	5UH	
DRAWING	NO. CHECKED BY		A	PPROVED BY	•
		<u> </u>		UNIT PRICE	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	MATERIAL & LABOR	ESTIMATED AMOUNT
	SUMMARY:				
1/0	LRB & ET PROCESSING				<b>d</b>
	FACILITY SUBSTATION	2	EA	510,436	1,020,872
2.	PADÁ LOX SUBSTATION		EA	510,436	
3.	PAD A FUEL SUBSTATION		EA	510,436	510, 436
4.	FEEDERS-LC-39 AREA	/	EA		10,846,045
5.	LRBGET UPS	-	EA	424260	
<u></u>	LRB'E ET EMERGENCY POWER		EA	220,372	220, 372
1	PAD' B LOX SUBSTATION	/	EA	50,436	510,436
8.	PAD B FUEL SUBSTATION	/	EA	510,436	510,436
	NEW MLP SUBSTATIONS *		EA		
10,	PADALOX EMERGENCY POWER		EA	220,372	220, 372
12	PADA FUEL EMERGENCY POWER PADB LOX EMERGENCY POWER		EA EA	220,372 220,372	,
12	PADB FUEL EMERGENCY POWER	1	EA	220372	220,372
1.0.	PHON PALLETINE TO THE		2,	229312	815 424 781
					1.1, 1.2, 1.6,
	TOTAL			SAY	\$15.500,000
	<u>a divisione a propieto de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania del compania del compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania de la compania del compania de la compania del compania de la compania de la compania de la compania de la compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del compania del co</u>	A. K. C.			
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<b>⊆</b>		PRELIMINARY COST ESTIMATE WORK SHEET					
, NO.	PCN	DATE PREPARE	:0	SHEET	2I of 6I		
PROJECT LR1	B INTEGRATION STUD				CODE		
· • • • • • • • • • • • • • • • • • • •	FEFDERS		<u> </u>				
ARCHITE	T/ENGINEER	ESTIMATOR L. H.	WASS	UH			
DRAWING			AP	PRQVED BY			
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOU		
	SUBTOTAL FROM SHEET 3I			·	86,391,160		
	SUB OVERHEAD	15	%		958,674		
	SUB PROFIT	10	%		734, 983		
	PRIME MARKUP	10	%	•	808, 482		
	BOND		%		88, 932		
	ESCALATION (IYR)	. 5	%		449,112		
	CONTINGENCY	15	0/0	•	1,414, 702		
	TOTAL				10,846,01		
				<b>VI.</b> 1			
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E	ROUND SUPPORT KSC PRELIMINARY COST QUIPMENT	DATE PREPARE			
. NO.		10-6	-88	SHEET	3 I of 61
PROJECT LR		אמ		Notation.	
LOCATION		LTAGE	2/57	R/-	CODE
30	TON CT/ENGINEER	ESTIMATOR			
ARCHITE		R.H.	WAS	SUM	
DRAWING	NO. CHECKED BY		AF	PROVED BY	
		1		UNIT PRICE	<del></del>
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	TINU	MATERIAL & LABOR	ESTIMATED AMO
	FEEDERS:		•		
	LRBEET PROCESSING				
	FAC/LITY (4600'):		-		
1.	13.8KV@ 200 A (4 EA)	55,200	LF	52	276,
2.	480V@ 400A (IEA)	18,400	LF	4.22	73,6
3.	DUCT BANK (6-4")	4,600	LF	17.00	50,6
<u> </u>	MLP PARK SITE #2 (4000')				
4,	13,8KV@ 200A(2EA)	24,000	LF.	5.00	120,0
5,	480V @400A (IEA)	16,000	2 F	4,00	640
6.	DUCT BANK (4-4")	4,000	1 F	7,00	28,0
	PAD LOX (52000)			500	
7	13.8KV@ 200A (2EA)	312,300		2	1,561,5
β.	7	208,200	LF	4,00	832, 8
9.	DUCT BANK (4-4")	52,000	27	8,20	4/6,0
	PAD FUEL (52,000)		وشع ر	50	1 -1
	13.8KV@ 200A(2EA)	312,300		400	1.56%
	400 A EMERGENCY (IEA)	208,200	i	800	832.8
12,	DUCT BANK (4-4") VAB HI-BAY 4 (2500')	52,000	2,7	0,	716,
	13.8KV@ 200A (IEA)	7 500	IE	500	375
19.	DUCT BANK (1-4")	2,500	15	200	50
17.	DIECE GALLERY	0,0			
15	1/21/10/25	1%		3000	73 6
/ / / /	Econyon on the 12 1	1.3.100	1 =	7,4	<b>ラクス</b>
		)			
	SUB. TETAL				16, 271,16

GROUND SUPPORT	KSC PRELIMINARY COST	ESTIMATE WO	RK SHEET	<b>.</b>	☐ CONSTRUCTION
	CN	DATE PREPAR			4 I of 6 I
		10-7-8	8	SHEET	7 2 of 2
R THIE	RATION STUD				
WHICH VOLT	AGE DISTRIE	UTION	. LC-	39 K3C	CODE
			<u> </u>		• • •
CT/ENGINEER		ESTIMATOR C.H.	11/00		
NO.	CHECKED BY	KITT.		PROVED BY	
	A				
		ESTIMATED		UNIT PRICE	
	ESCRIPTION	QUANTITY	UNIT	& LABOR	ESTIMATED AMOUNT
	PIED POWER				
, , –	IPS), 3PHASE,				_
	C, 600KVA	1	EA	250,000	\$250,000
SUB OVER		15	0/0	230,000	37, 500
1	•	10	%		28 750
SUB PRO		10	%		31.625
BOND	4RRUP	1	%		7 479
·	ON (IYR)	5	0/0		17 568
CONTING		15	%		55 338
Canting			70		424 260
					127,
NCLUDES VA	ENDOR QUOTE	ON 545	TEM	OF \$	71,637.00
			- 1 Ha		
	Y. A. S. S. S. S. S. S. S. S. S. S. S. S. S.				
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☐ Ç	ROUND SUPPORT KSC PRELIMINARY COST QUIPMENT	ESTIMATE WO			☐ CONSTRUCTIO		
1. NO.	PCN	DATE PREPARI		SHEET	5 I of 5 2		
PROJECT LRE	3 INTEGRATION STUD	Y					
LOCATION TEA	NOMO A EMERGENCY POWE	TION RI	en i	9 ND C-39 K3	COOE		
ARCHITE	TYENGHEER	ESTIMATOR		BUM			
DRAWING	NO. CHECKED BY		AF	PROVED BY			
ITEM NO.	DESCRIPTION	ESTIMATED YTTHAUD	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOL		
	TYPE CDP CONVERTIBLE						
	DISTRIBUTION PANELBOARD:						
1/1	PANELBOARD 480/277436441000A	. /	EA	2,500	2,50		
2.	MAIN LUG 1200A, 30, 4W		EA	2,700	2,70		
3.	CIRLIT BREAKER GOOA/ADT.	6	EA	1,900	11,4		
,	TEANSFORMERS!						
4	480V-208/120V. 36 4W.112.5KVA	2	EA	12,000	2400		
5,	4804-208/1201 30 4W 75.0KVA	2	EA	9,400	18,8		
6.	+80V-208/120V, 30 4W 7.5KVA	2	EA	1.000	2,0		
	SECONDARY DISTRIBUTION:	·		),			
7	42 CKT 304W. ZZ5A 208/120V	2	EA	1125	22		
	42 CKT, 30, 4W, 100 A. 208/120V	2	EA	1000	2,00		
9.	IP CIPCUIT BREAKERS JOAF	100	EA	50	5,00		
10:	3P CIRCUIT BEEAKERS 125AF	90	EA	540	48.60		
					11925		
	SUB OVERHEAD	.15	%		17.88		
	SUB PROFIT	10	%		13,71		
	PRIME MARKUP	10	%		15,08		
	BOND		0/0		1,65		
	ESCALATION (IYR.)	5	%		8,38		
	CONTINGENCY	15	%		26, 39		
	TOTAL				P220, 3		
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	ROUND SUPPORT QUIPMENT	KSC PRELIMINARY C	OST ESTIMA	re wo	ORK SHEET	ſ	٠. ١	CONSTR	OCTION
Y. NO.	₽	CN	DATEPR	EPAR	€D.		SHEET	<u>6</u> I of	bI
PROJECT							·_ •.		
$\rightarrow$		TION STUD AGE POWER				<del>- 4</del> /		CODE	
	DOUBLE	ENDED SUB	STATI	ON		<i>)</i>			
ARCHITE	CT/ENGINEER								
DRAWMG	NO.	CHECKED BY	E./7		14350	PROVED	BY		· · ·
							•	•	-
			ESTIMA	TED		UNIT PE			
TEM HO.		SCRIPTION	THAUP		TINU	& LAB		ESTIMATE	D AMOUNT
/.		WITCH 13.8K	/				-		
	: <i>)</i>	POSITIONS WI	<b>I</b>						
7	GOOA CIPCUL				EA	18,0	00	36	,000
		ER, DRY TYPE			- A	110	-	<u> </u>	16 00
		13.8KV-480/21	71 2	'. 	EA	42,0	700	8	400
9	DISTRIBUTIO				- 4				<del></del>
		TH. 4 SPACES		<u>7                                    </u>	EA	8,5			9500
4.		H 3 SPACES		<u> </u>	EA	6,0			2,00
2.		NSITION RACK		<u> </u>	EA	2,0			4,00
6.		PANSITION PAC		2_	EA	2,5	00		5,000
7	_	EIMARY SWITCH	1			*	,	<del></del>	
	RACK		<	7	EA	.40	00		8000
0	LOAD CENT			<u>, , , , , , , , , , , , , , , , , , , </u>					// 0.0
		A ADJ. C.B. PAN		<u></u>	EA	2,9			6,88
		A ADT.C.B.PAN		7	EA	6,8		· · · · · · · · · · · · · · · · · · ·	4 000
		A ADT. MAING		4	EA	2,2	00		4,40
//		PREMOTE SENS		2		2 "			7000
	PANEL				EA	35	00		
	SUB OVERHI	<i>E 1</i> D		15	2/	•		300	780
	SUB PROFI			15	10		•	<del>73</del> ,	
	PRIME MA			10	0/			26	290
	PAND	m, a.		1	0/			<u> </u>	18
	ESCELETION	1/1/20		<i></i>	-7-3 -37-1			•	
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